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Our Dark Streets.

The work of cutting down the wires and poles in New York has proceeded in a very reckless manner during the past week. The parties engaged in the work apparently have not been able to realize that cutting a wire at one point breaks the entire circuit, and they have pursued their labors up to so late an hour that it was utterly impossible for any of the electric lighting companies to test or renew, were that permitted, their circuits. As a consequence the streets of the city have been plunged in darkness, and the press of the city is just now apparently becoming awake to the fact that there are worse dangers than a few stray electric light wires.

The customers of electric light companies are not at all pleased with the situation, and are offering two or three dollars per night for arc lamps in front of places of business.

All the arc companies have shut down and, as they state, are waiting until the city gets through chopping wires. They are not neglecting to keep track of the needless damage that is being done by the choppers however.

In a recent interview Mr. Paul D. Cravath, one of the attorneys of the United States and Brush Companies, said:

"A little discretion on the part of the city would obviate this difficulty, and make it possible for the people to have a well-lighted city, without in any way interfering with the work of chopping down wires. It would be highly dangerous for the companies to attempt to use the wires without first making a thorough examination of them, in order to see that they were in good condition, and repairing the circuits that had been cut. But the men engaged in chopping down the wires work until four o'clock in the afternoon. It is nearly dark then, and altogether too late for us to attempt getting things into shape for business. If the city would order its men to stop work, say at noon, this might give us a chance to make everything safe and furnish the city with light until the city had got through with us, and we could resume business in a permanent way again. This could be done much more readily if the work of cutting down the wires would be done with some discretion. The work is carried on indiscriminately, and instead of beginning at the end of the wires the workmen usually start near the plant where there is generally a great net of them, and by cutting one at this end they ruin the usefulness of the wire during its whole length. There are comparatively few wires taken down in proportion to those rendered useless. If the work were begun at the point furthest from the factory much less damage would be done, for then there would be no danger of injuring any wire but the one declared to be unsafe."

Mr. Cravath said that the companies could not use their arc lights for lighting the streets, except in the subway districts, where there are comparatively few lights.

"It is not our fault," he said, "that all the wires are not underground, for this will be impossible, of course, until the subways are extended. We have no control over the extension of the subway system. The city wants all the overhead wires taken down. Where shall we put them? The city hasn't provided a place for them and we have no power to. Nobody wants the streets lighted so much as we do, and this is the kind of weather and just the time of year when they should be well lighted. Let somebody tell us how long it will be before the city is through chopping our wires and breaking circuits, and then we will be able to state just how long it will be before we will be able to light the streets again."

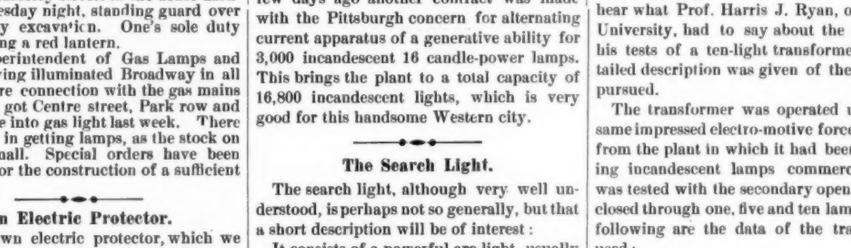
The city never wanted electric lights worse than it did last night, said the New York *Sun*, December 19th. The heavy folds of gray fog and the driving sheets of rain mad it almost impossible to travel on foot with any feeling of security. Between 5 and 6 o'clock, when the big office buildings down town were disgorging their tenants, and the sidewalks were crowded and the streets were filled with clattering trucks and cars, the fog came down so thick that it was difficult to see across Broadway. The gas lights in the street lamps hardly counted. The shopping thoroughfares uptown were jammed with people, nearly all of whom were laden with bundles, and the proverbial patience of an American crowd was tried a good deal in the dark, sloppy, travel-choked streets.

Nine watchmen were strung along Houston street for a block and a half between Elizabeth and Mulberry streets in the dense darkness of Tuesday night, standing guard over the subway excavation. One's sole duty was watching a red lantern.

The Superintendent of Gas Lamps and Lights, having illuminated Broadway in all places where connection with the gas mains was found, got Centre street, Park row and Irving place into gas light last week. There is difficulty in getting lamps, as the stock on hand is small. Special orders have been given out for the construction of a sufficient number.

An Electric Protector.

The Brown electric protector, which we illustrate this week, is indorsed by the Inspector of Insurance Patrol and Electric Lighting for the Philadelphia Board of Fire Underwriters. Any abnormal current that may be introduced into a building by reason of a telegraph, telephone or district wires coming in contact with electric light wires or lightning, must first pass into the protector through the german silver or fusible wire; thence through the coil of electric magnet, magnetizing the core thereof, attracting the armature whereby the instruments protected are shunted from the circuit and the abnormal current is carried direct to the ground and concentrated entirely upon the german silver wire, which action causes the same to fuse and completely open the line.



A milder abnormal current, which might by continuous and cumulative action injure the instrument and possibly cause fire, is automatically grounded until such current is broken or reduced, and when at the point of safety the instruments protected are again brought automatically into circuit; this also applies to atmospheric electricity or lightning. The total resistance of the instrument is about ½ of one ohm. The New York office of this company is at 853 Broadway, where the instrument can be seen in operation at any time.

The Denver Light Plant.

The alternating current central station plant of the Consolidated Electric Company in Denver, Col., is now one of the largest in the western part of the States.

The Westinghouse Electric Company received the initial order for a contract of alternating current apparatus from the Denver corporation about two years ago. That contract amounted to apparatus for generating a total capacity of 6,500 alternating current 16 candle power lamps.

In view, however, of the fact that the system has grown in popularity very considerably, and as the demand for electric lighting by the alternating current has increased, several additions have become necessary to enlarge the capacity of the plant.

Not long after its establishment an additional order for apparatus was awarded to the Westinghouse Company and that growth of the plant has kept steady going, until a few days ago another contract was made with the Pittsburgh concern for alternating current apparatus of a generative ability for 3,000 incandescent 16 candle-power lamps. This brings the plant to a total capacity of 16,800 incandescent lights, which is very good for this handsome Western city.

The Search Light.

The search light, although very well understood, is perhaps not so generally, but that a short description will be of interest:

It consists of a powerful arc light, usually of about 25,000 candle-power, contained in a metal cylinder about 30 inches long by 24 to 30 inches in diameter. One end of the cylinder is closed by a silvered concave reflecting lens. The carbon points of the lamp are placed in such a position within the cylinder as to bring them in the focus of the lens. The opposite or front end of the cylinder is fitted with glass doors, through which the beam of light passes. The apparatus is on a pivot, so that it may be revolved around the center, and it is also arranged for elevation and depression from a horizontal position.

As ordinarily used, the beam of light emerging from the cylinder is so concentrated that at a distance of 1,000 yards from the ship it illuminates a path only about 15 yards in width. When necessary, however, a broader arc can can be illuminated. One of the 20,000 candle-power lights will reveal an object at a distance of two and one-half miles. The effect of the perpendicular search light in a fog to those at a distance has been described as very much resembling the aurora borealis.

—— An interesting installation of an electric light plant has just been made at Pocahontas, W. Va. The station is located in the wildest part of West Virginia, at an altitude of 2,266 feet. The pole lines on leaving the station for Bramwell and Pocahontas run in opposite directions, and in crossing the mountains to reach these places it was necessary to hew a path through dense woods and up almost perpendicular bluffs, inaccessible even to the sure-footed mules. The entire circuit comprises about 15 miles of copper.

Transformers.

INTERESTING PAPER BY PROF. H. J. RYAN, OF CORNELL UNIVERSITY.

The general interest existing in electrical circles regarding transformers was clearly shown by the large attendance at the meeting of the American Institute of Electrical Engineers, in this city, December 17th. Although a very stormy night, the meeting room of the Society of Civil Engineers, where the engineers meet, was crowded to hear what Prof. Harris J. Ryan, of Cornell University, had to say about the results of his tests of a ten-light transformer. A detailed description was given of the methods pursued.

The transformer was operated under the same impressed electro-motive force supplied from the plant in which it had been supplying incandescent lamps commercially. It was tested with the secondary open, and also closed through one, five and ten lamps. The following are the data of the transformer used:

Number of turns in the primary coil, 675. Number of turns in the secondary coil, 35. Resistance of the primary, 21.8 ohms. Resistance of the secondary, .04 ohms.

The iron disks of the magnetic circuit were one-half millimeter in thickness, the surfaces merely oxidized so that no special insulating material was provided between the laminations. The total volume of laminated iron used was 2,050 cubic centimeters. The mean cross section of the magnetic circuit was 63.3 square centimeters, and the mean length of the magnetic circuit, 30.8 centimeters.

	Primary E. M. F.	Current.	Secondary E. M. F.	Mean of Ammeter Read gs
Observed square root of mean squares with secondary on open circuit	1,025	.14	54.5	
With secondary closed through one lamp	1,053	.196	52.3	1.26
With secondary closed through five lamps	1,050	.390	51.	5.83
With secondary closed through ten lamps	1,040	.631	49.3	10.65

Curves plotted from the observations clearly showed the rate at which energy was given to the transformer, or that the transformer restored to the circuit at all points of a complete alternation for the several conditions under which the transformer was operated. The following are the percentages of the work given to the transformer that is re-

stored to the circuit by it under the foregoing conditions. Open circuit, 6.8 per cent. One lamp, 3.9 per cent; five lamps, .96 per cent; ten lamps, .36 per cent. The above observations and data were sufficient for the computation of the various losses of energy that take place in the transformer under the several loads and under no load, and the deduction of the corresponding efficiencies as given in the following table:

	*Secondary E. M. F. (Primary 1020.)	Primary Watts.	Secondary Watts.	Efficiency Per cent.	Total loss in Watts.	Hysteresis loss in Watts.	Heating Loss.	
							Primary Watts.	Secondary Watts.
Secondary open.	52.3	96.1	0.0	0.0	96.1	95.7	0.4	0.0
One lamp.....	52.3	159.1	64.3	41.1	94.8	93.9	0.9	0.0
Five lamps.....	50.1	388.6	300.9	77.5	87.7	83.1	3.3	1.3
Ten lamps.. ...	47.5	607.9	525.0	86.6	82.9	69.7	8.7	4.5

When this correction is applied the drop of 3.5 volts obtained is what was observed by direct measurement on the secondary.

It is interesting to note that this transformer might be loaded to twice its rated capacity and the heating of the coils would still be less than that of the iron, although the heat produced by the iron grows less as the load comes on. Likewise that its efficiency would not yet have reached its maximum, and that it would have a value of 92 per cent. It was shown by the curves that the energy wasted by eddy currents was small.

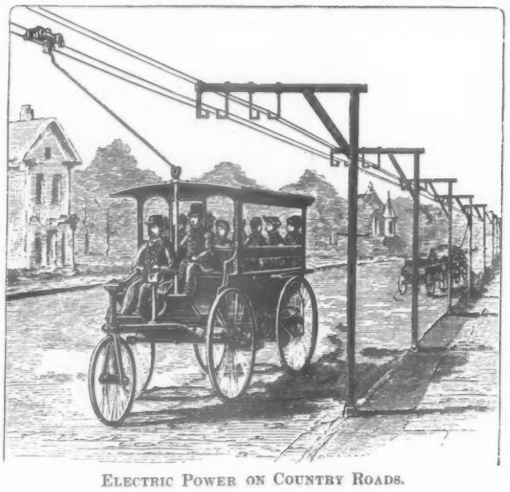
The assumption made by Mr. Swinburne in his valuable paper on the "Design of Transformers," appears to have been fully substantiated. Mr. Mordey's experiments in which hysteresis and Foucault current losses producing a common loss were determined, were performed by cycles of magnetization produced by rotation in which the degree of magnetization did not vary in amount but direction, and cannot be said to throw light on the correctness of Mr. Swinburne's assumption. Commenting on this paper, some have used Mr. Mordey's results as evidence that these assumptions are wrong. By a knowledge of the magnetic properties of the iron with which a given transformer is to be built, and the methods made use of by Mr. Swinburne, its efficiency is something that can be correctly predetermined. The importance of making a transformer produce the same E. M. F. at the terminals of the secondary under all loads, asserts itself when it is used for incandescent lighting. In the transformer under consideration, the magnetization produced through the secondary and the magnetization set up about the primary in its own air space are determined. This leakage of magnetism amounted to about 1.2 per cent. When the transformer worked on full load 4.5 times as much current passed through the primary, and the leakage of the primary in its own space was 4.5 times as much as on open circuit and became 5.4 per cent. This value, together with the small drop due to the actual resistances of the transformer coils, accounts for the fall of 3.5 volts that was observed by turning on all of the 10 lamps. A similar leakage in magnetism takes place in the secondary circuit, producing a self-induction proportional to the secondary current. The rate of change of this quantity is then proportional to the E. M. F. that it produces. This E. M. F. is therefore a quarter of a period behind the secondary current, and results in producing a small lag in primary and secondary currents and secondary E. M. F. One peculiarity of this transformer remained to be accounted for; that is, the considerable decrease in the loss by hysteresis, as it is loaded down, that is not to be accounted for by rise of temperature or the falling off of the magnetization due to the increased leakage about the primary in its own air space. Prof. Ryan made the following suggestion as to the reason for this: Mechanical shock has been shown to greatly reduce loss by hysteresis when iron is passed through cycles of magnetization. Since the currents are at all times opposite each other in the two coils of a transformer, strong repulsion occurs when these currents are at a maximum and no force is exerted when they pass through zero. So it follows that they continually keep thrusting each other apart when at work and add to the disturbance of the laminated iron that already exists on account of its changing magnetization. This increasing of the mechanical vibration of the iron may, therefore, account for the above mentioned phenomenon. On open circuit the maximum magnetization of the iron per square centimetre was 3,850 C. G. S. Loss by hysteresis per cycle per cubic centimetre, neglecting Foucault currents, .046 watts at 138 alternations per second, coercive force per centimetre of the iron 2.76 C. G. S. The conclusion of Prof. Ryan was that the data given show clearly the advisability of providing some practical means for breaking the primary circuit of the transformer when not in use, as insisted upon by Mr. Swinburne.

The paper was discussed by Messrs. Kennelly, Tesla, Mailloux, Stillwell and others, while Prof. Geyer called attention to the similarity of the results obtained with those attained at Stevens Institute under similar conditions.

* The values given in this column have not been corrected for the two lamps in series with the primary for the first three conditions, and the one lamp that was used for the last. With 10 lamps, where one lamp was used in the primary, this correction amounts to an increase of the secondary E. M. F. of three per cent. On open circuit and one lamp it is negligible and three per cent. increase for five lamps.

Country Road Electric Propulsion.

Messrs. Dibble & Garney, of Hill City, Dak., are the inventors of the system illustrated on this page. In mountainous districts are often to be found tremendous forces of water power expended in a fall from lofty heights. These waterfalls are, as a rule, so situated as to be inaccessible for use. One of our wide-awake and far seeing inventors, says the *World's Progress*, has patented a method of utilizing this force in the most practical and beneficial manner possible. The vast power in the remote and inaccessible location is to be used to turn a wheel to run a large dynamo, whose power can easily be transmitted to localities where traveled routes are established. This brings us to the view presented in the accompanying engraving, and shows the practical outcome of the idea. The design is to afford a rapid motive force to run vehicles along an ordinary road without railway tracks. The illustration shows an example of a vehicle loaded with passengers, and having a steering device forward, by which the course can be guided within a considerable range. The steering can be arranged to be automatic, by arranging it to be operated by the bar leading to the trolley that travels along the wires. The course of wires being double, allows the trolleys a through route, even though they are close together, as meeting vehicles can be easily guided aside and pass without taking the trolleys off their routes. Not only passenger vehicles, but freight wagons can be arranged to run by this system. It would be particularly interesting and enjoyable to glide along in this manner, conscious that the fountain of power is located in the solitude of a distant mountain gorge,



Electric Power on Country Roads.

facilities which American engineers have in the past enjoyed, and still enjoy, in extending their business, by simply being allowed to erect open wires everywhere through the streets. Even where wires are now being put underground, they are largely put underground in order to carry on existing work and to extend it, not merely to take advantage later of what may chance to turn up on the route.

"Besides this, we have all had it drilled into us by this time that it does not matter how perfect, how desirable, how useful a thing is likely to be, before it can come into general use the public have got to be educated up to it, to see it, and feel its desirability and utility, and its practicability—to understand it each man for himself. Now, the American system of overhead wires and cheap line construction, bad as it may be in itself, has from the very first brought electricity home to everybody, right to their very doors, not so much as a luxury, but as a practical desirable factor of everyday life, an attraction to public resorts, and a good advertisement for business. Consequently electricity is in America no more a wonder, but a fact of everyday life to an extent that it is not yet here.

"Looking at their plant, looking at their apparatus, and looking at the facilities which Americans have enjoyed for extended practical experiments on a large scale, it does not appear to me that their actual achievements, simply from an engineering and scientific point of view, have been greater than ours have, in spite of the apathy on the part of the public and investors with which we have had to contend. Still, the fact remains that they have done more business than we have, even considering the difference in population.

Of what work we have done so far, Englishmen may feel justly proud, and with better times I trust we may still be able in friendly rivalry to show that we are competitors worthy of America's best mettle."

In the discussion that followed, Prof. Forbes indorsed the remarks about the rough and ready way in which the work was carried out in this country, and thought that the more solid English construction would pay better in the long run. He said that great attention has been paid to testing in American factories, and as a result the efficiency of apparatus is considerably increased.

Prof. Sylvanus P. Thompson expressed his opinion that the greater steadiness of the American arc light, of which mention had been made, was due to the greater personal pride which the American attendants had in the particular system with which they were connected.

Mr J. Swinburne thought the American system, wherein the perfecting of designs in experimental work are kept quite disconnected from the wholesale manufacturing parts, better than the English method.

The president of the Institute thought it advisable that English electricians should acquire whatever good they could get from the "rough and ready" method adopted in America, and said that progress was often retarded waiting for perfection.

In concluding the discussion, Mr. Addenbrooke, the author of the paper, agreed with Prof. Forbes about the way testing is appreciated, and as regards the greater interest which the men take in their work, as mentioned by Prof. Thompson, he attributed it to the better wages and the better chances of promotion which exists in America.

Electrical Engineering in America as Viewed by an Englishman.

Mr. G. L. Addenbrooke recently delivered an interesting address on the above subject before the Institute of Electrical Engineers, London. Mr. Addenbrooke has visited all the cities of the United States from San Francisco to New York. He saw a great deal to criticise from his point of view, everything appearing temporary and expedient, which was very offensive to his English eyes. The large electrical works in New York, Pittsburgh, Lynn, Mass., etc., were visited and described at length.

Mr. Addenbrooke closed his lecture as follows:

"In the early portion of this paper I endeavored to convey an idea of the roughness and crudeness of American outside construction work. After reading over the proofs of the paper, I do not think I have overdrawn the picture; rather it is underdrawn, if anything. At the same time, I do not wish it in any way to be understood that American engineers are necessarily rough and untidy in their ideas, and incapable of different work. Besides their electrical plant, the numbers of beautiful tools, crowned by the latest pattern of the phonograph, which come over here from America, point to an entirely different conclusion. In accuracy of workmanship and careful finish, when they consider it suits their purpose, the Americans are our equals, if not our superiors; the difference lies in the fact that our ideas often differ from theirs as to where this accuracy and careful finish should come in. English engineering would hardly dare to appear before its fellow-citizens as the responsible owner and designer of such a terrible eyesore as American outside work is; but the American engineer appears to look at it from a different point of view. It is not his business to think of his fellow-citizens. Each of his fellow-citizens, he considers, is quite competent and capable of taking care of himself. It is the business of the electrical engineer to forward and extend the applications of electricity. If in doing this he does anything disagreeable to his fellow-citizens, it is for them to protest when it becomes intolerable to them, not for him to think of it beforehand,

"And I would like you to try and think for yourselves, and really feel the enormous

The Falls of Niagara to be Utilized for Power.

These famous Falls, it is estimated, would, if fully utilized, afford all the way from 10 to 15 million horse-power; probably enough to run all the machinery in the New England States. The magnitude of the undertaking, as well as the fact that no water wheel has ever been found adapted to such conditions, has heretofore discouraged any atttempts to make use of this stupendous power. Turbine wheels, it is well known, cannot be operated under any such head as these Falls afford, their usefulness being limited to heads ranging from 10 to 30 and 40 feet, and as there are many other streams from which this much fall can be obtained that do not present such difficulties of application, the great wealth of energy Niagara affords has been allowed to run to waste.

A commission from the Canadian authorities, consisting of a member of parliament and several noted engineers, recently visited the Pacific coast to investigate the merits of the Pelton water wheel with reference to its adoption in various enterprises projected in the provinces, but more particularly for the purpose of utilizing the water-power of Niagara Falls from the Canadian side. The result of the investigation was satisfactory in the highest degree, and will undoubtedly result in the first attempt to make this gigantic force available for manufacturing and commercial purposes.

The height of Niagara Falls is 176 feet. By carrying water in steel conduits a distance of about three-quarters of a mile to a point below the rapids, a fall of 240 feet can be obtained. This entire fall it is proposed to utilize, placing the wheels above high water mark along the bank of the river and locating various manufactories on accessible sites above, the power from the wheels to be carried up by a system of cable transmission. Anywhere from 100,000 to 500,000 horse-power can, it is estimated, be obtained in this way without any appreciable loss in the current which sweeps along with such irresistible force.

In addition to local manufactories, dynamos will be run to supply power and light to the adjacent towns and cities, as also to transmit electrical energy for power and light to the cities of Buffalo and Toronto, which are only about 20 miles distant.

The project, though one of great magnitude, is now believed with the means at hand to be perfectly practicable, and the utilization of these great falls, about which there has been more discussion than any other problem of modern times, seems about to be realized.

New Form of Engine and Dynamo Combined.

The combined engine and dynamo we illustrate in this issue is manufactured by Messrs. King, Brown & Co., of Edinburgh. The apparatus was recently described in *Industries*, our esteemed London contemporary, and from the description we get the following: It is a combined single cylinder engine and vertical single magnet dynamo. This type of combined plant has been designed especially for use on board ship, where the space is limited. The whole dynamo rocks on a pin at the bottom, so that the belt can be kept taut by a thrust spring arrangement, which is clearly shown in the engraving. By this means a dynamo can be easily driven by a very short belt without any chance of slip, or of excessive tightness of the belt, or of a loose or flapping return. These combined sets are now largely used on passenger steamers.

The following are the particulars of the dynamo for 150 lamps:

Armature, Gramme wound, 9¼in. outside diameter, 5¼in. inside; length over end plates, 7in.

Field magnets, wrought iron; circular section, 7in. diameter; winding, 9½in. long; section of yoke (cast iron), 7⅜in. by 8in., or 59 square inches.

Commutator, 48 sections, 6 turns of copper strip per section.

Armature, copper, 288 turns 0.17in. by 0.09in.

Shunt coils, 3,124 turns of No. 18 B. W. G. on each limb.

Series coils, 21 turns on each limb.

Shunt resistance, 61 ohms; series, 0.013 ohm; armature, 0.068.

Speed, 1,020 revolutions per minute.

Electro-motive force, 100 volts at all loads.

Full current, 90 amperes.

The armature is mounted on four-arm gun-metal spider, keyed to the shaft. There are two brushes on each side of the commutator. All the joints in these machines are, of course, soldered with rosin. A very ingenious arrangement is used in the large machines to prevent any tendency to sparking at the top and brushes, which is an evil likely to be present in large single-limb Gramme machines. The fields are bored a little too large, and the armature is mounted above the center of the bore, so as to be nearer the top than the bottom pole corners. The arrangement works admirably.

Wiser Than He Knew.

Joseph Glanvill, sometimes called "Sadducismus Triumphantus Glanvill," rector of Bath from 1666 to 1672, was a learned writer upon abstruse and mystical subjects, but in a style of which it is not always easy to catch the meaning. In one of his treatises, called "The Vanity of Dogmatizing," printed in 1661, chapter 21, he is speaking of "supposed impossibilities, which may not be so." In the concluding sentence of the following passage he seems to have anticipated the electric telegraph: "But yet to advance another instance. That men should confer at very distant removes by an extemporary intercourse is a reputed impossibility; but yet there are some hints in natural operations that give us probability that 'tis feasible, and may be compassed without unwarrantable assistance from dæmoniack correspondence. That a couple of needles equally touched by the same magnet, being set in two dials exactly proportioned to each other, and circumscribed by the letters of the alphabet, may effect this 'magnale,' (*i. e.*, important result), hath considerable authorities to avouch it.

"The manner of it is thus represented: Let the friends that woud communicate take each a dial, and, having appointed a time for their sympathetic conference, let one move his inpregnate needle to any letter in the alphabet, and its affected fellow will precisely respect the same. So that would I know what my friend would acquaint me with, 'tis but observing the letters that are pointed at by my needle and in their order transcribing them from their sympathized index, as its motion directs; and I may be assured that my friend described the same with his, and that the words on my paper are of his inditing. Now, though there will be some ill contrivance in a circumstance of this invention, in that the thus impregnate needles will not move to, but avert from each other (as ingenious Dr. Brown hath observed), yet this cannot prejudice the main design of this secret conveyance; since it is but reading counter to the magnetic informer, and noting the letter which is most distant in the Abecederian circle, from that which the needle turns to, and the case is not altered.

"Now, though this desirable effect possibly may not yet answer the expectations of inquisitive experiment, yet 'tis no despicable item, that by some other such way of magnetic efficiency, it may hereafter with success be attempted, when magical history shall be enlarged by riper inspections; and 'tis not unlikely but that present discoveries might be improved to the performance."

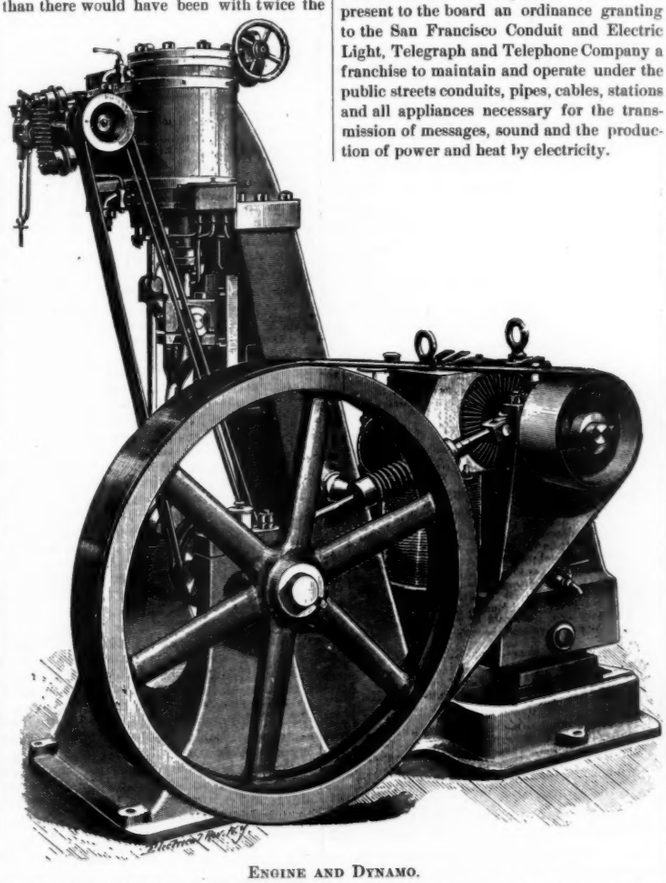
Electric Lights in Austro-Hungary.

There are already five electric lighting stations in Vienna, says *Industries*, all of them in robust circumstances, and the provincial towns, especially the capitals of the provinces, are rapidly following in the same direction towards the adoption of the electric light. A great many manufactories near electrical works are now being lit by electricity. Several mills in Buda-Pesth and a large number of sugar factories in Bohemia and Hungary have adopted the electric light. There are central stations at Marienbad by Ganz & Co.; at Neuhaus, in Bohemia, on the Krizik system; at Buda-Pesth (projected); one in operation at Temesvar; at Innsbruck, by Ganz, on the Zipernowsky-Deri-Blathy system; at Triente; at Salzburg, by Siemens & Halske; at Gastein, by B. Egger & Co.; at Graz, in Styria, by Siemens & Halske.

Humbug vs. Wisdom.

[*N. Y. Sun.*]

There is more genuine danger to life in New York, when as dark as it was last night, than there would have been with twice the number of electric wires which have fallen during the last cutting crusade.



ENGINE AND DYNAMO.

It cannot be said either that the authorities are clear of responsibility for plunging large portions of the town into this deplorable condition of darkness. There has been quite as much humbug as wisdom about their share in the proceedings.

Chicago, Ill.—Electric Novelty Manufacturing Company, at Chicago; to manufacture electric novelties and to do a general electric business; capital stock, $110,000; incorporators, H. E. Chapman, Byron A. Todd, A. S. Upson.

Pittsburgh, Pa.—A charter was filed in the recorder's office for the Pittsburgh, Allegheny and Manchester Traction Company. The corporation is formed for the purpose of constructing and operating of motors, cables and other machinery for the supplying of motor power for street railways. The capital stock is $5,000, divided into 100 shares at $50 per share. The subscribers and directors are John H. Dalzell, John D. Nicholson, George B. Hill, William I. Mustin and Alex. M. Neeper. They hold 20 shares each.

Chicago, Ill.—At Springfield articles of incorporation were issued to the Calumet and Michigan Telegraph Company at Chicago, to construct and maintain a line for the transmission of all kinds of electric signals. The incorporators are Walter Fairbank, Spencer Eddy and G. M. Glessner.

Beatrice, Neb.—Articles of incorporation of the Beatrice Electric Light Manufacturing Company have been filed in the office of the Secretary of State. The capital stock is placed at $10,000, shares $50 each. The incorporators are A. C. Jordan, L. E. Spencer, L. E. Walker, H. F. Slocum and A. J. Albrook.

Snow Hill, Del.—The Snow Hill Electric Light and Power Company has been formed and the following officers elected: John P. Moore, president; William S. Wilson, secretary and treasurer; John P. Moore, Clayton J. Purnell, John J. Collins, Thomas U. Purnell, W. S. Wilson and Martin S. Neargis, directors.

San Francisco, Cal.—The Street Committee of the Board of Supervisors decided to present to the board an ordinance granting to the San Francisco Conduit and Electric Light, Telegraph and Telephone Company a franchise to maintain and operate under the public streets conduits, pipes, cables, stations and all appliances necessary for the transmission of messages, sound and the production of power and heat by electricity.

Albany, N. Y.—The Central Electric Construction Company, of Albany; to install or construct electric lighting, power and heating plants; also to furnish all materials for and equip street railways, and any other railways that may be operated by electricity. The capital stock is $100,000. The managers are John F. Moffett, Henry C. Hodgkins, John V. Clarke, Charles T. Moffett and Francis H. Leonard, Jr. Also the Electric Engineering and Supply Company, of Albany, to buy and sell all kinds of machinery.

Oakland, Cal.—Oakland capitalists have prepared plans for a system of street railways in East Oakland, and if the papers can be prepared in time the City Council will be asked for a franchise. The incorporators will be Hugh Slicer, C. D. Bates and A. T. Arrowsmith, of the Alameda Macadamizing Company, and A. D. Thompson, cashier of the First National Bank. The applicants intend to apply for a franchise to run their cars by horse-power, and when the matter of authority for granting franchises is definitely settled, the motive power will be changed to electricity.

Milton, Pa.—The Milton Electric Light Heat and Power Company, of Milton; capital, $5,000.

La Grande, Ore.—The La Grande Edison Electric Company has been organized. President W. H. McDonald; vice-president, H. Ansen; manager, J. K. Roming.

Camden, N. J.—The Julien Electric Traction Company filed in the register of deeds office, in Camden, a deed of trust for $200,000 to the Mercantile Trust Company of New York.

Oakland, Cal.—Councilman Cameron announces that at the next meeting of the City Council he will introduce a bond ordinance to purchase and place poles and wires for a system of electric lights for the entire city.

Chicago, Ill.—The Marseilles Street Railway and Electric Light Company, to operate an electric street railway and furnish light; capital stock, $30,000; incorporators, James Montgomery, Joshua Smith and J. F. Clark.

Salem, Ore.—The Yaquina Bay Telephone Line Company filed articles of incorporation in the sum of $1,000. B. F. Jones, J. H. McNeil and Beal Gaither are the incorporators. The line will be run from Toledo to Yaquina City.

Port Carbon, Pa.—A meeting of citizens was held, at which it was decided to organize an Edison Electric Light Company. It is proposed to build a plant to furnish 300 lamps. The necessary capital is pledged and the leaders in the movement will begin work at once.

San Francisco, Cal.—The Exploiting Company has incorporated for the sale and manufacture of phonographs, with George H. Bradshaw, W. D. Walker, William B. Johnson, Leon Goldstein and John Hutchinson as directors. The capital is $1,000,000, of which $1,000 is subscribed.

Baltimore, Md.—The Baltimore Specialty Company, for the purpose of manufacturing and dealing in mechanical inventions, etc., was incorporated by George H. Coursen, James P. Poullain, George Savage, Archibald H. Taylor and Garrett Savage. The capital stock is $3,000.

Saratoga Springs, N. Y.—The Consumers' Gas and Electric Light Company, of Saratoga Springs, filed a certificate of incorporation with the Secretary of State. The capital stock is $100,000, divided into $100 shares. The objects are the manufacturing, generating and use of electricity as a means of lighting the streets and houses of Saratoga Springs. The directors are William A. Pierson, Frederick Tarrant and George W. Morton.

Milwaukee, Wis.—Articles of incorporation have been filed in the Secretary of State's office by the Midland Telegraph Company, of Milwaukee, with a capital of $25,000. The object of the company is to construct a telegraph line from Milwaukee to Waukesha, Pewaukee, Oconomowoc and westward. The incorporators are Charles Polachuk, Charles L. Clason, Otis D. Crocker, H. J. Killelea and Charles P. Huntington.

Geneva, N. Y.—The Geneva Brush Electric Light and Power Company has been incorporated to operate the Brush Electric Company's plant at Geneva. The incorporators are Messrs. P. N. Nicholas, O. J. C. Rose and Charles Avery, of Geneva, and Jathan Potter and James F. Hughes, of Cleveland. Mr. Potter is treasurer, and Mr. Hughes cashier of the Brush Company of Cleveland. The capital stock of the Geneva Company is $100,000.

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We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, DEC. 28, 1889.

CONTENTS.

	PAGE.
Our Dark Streets	1
An Electric Protector	1
The Denver Light Plant	1
The Search Light	1
Transformers	1
Country Road Electric Propulsion	2
Electrical Engineering in America as Viewed by an Englishman	2
The Falls of Niagara to be Utilized for Power	2
New Form of Engine and Dynamo Combined	3
Wiser Than He Knew	3
Electric Lights in Austro-Hungary	3
Humbug *vs.* Wisdom	3
New Corporations	3
"Hit Him Agin—He's a Dutchman"	4
Elevators Operated by Electricity	4
Electrical News:	
Our Washington Letter	4
Our Boston Letter	5
Our Chicago Letter	5
A Letter from Prof. Rowland, of Johns Hopkins University	5
Another Subway Explosion in New York	5
Personal	5
The Electric Club	5
Telephonic News	6
From an Impatient Telephone Subscriber	6
The Telephone and the Gout	6
The New Induction Theory	6
The Tariff on Copper	6
The Hottest Spot on Earth	6
Delayed Dispatches—A Christmas Sketch	6
Alfred Vail and the Electric Telegraph	7
A Youthful Experimenter Startles His Father	7
Telegraphic	7
"Umgekommen" and "Angekommen"	7
Kansas City's New Electric Club	7
The Difficulties of Matrimony Among Russian Girls	7
Electric Power	8
The Decatur, Ill., Electric Railway	8
"Electricity in the Household"	8
An Electro-Technical Exhibition for Frankfort	8
Testing an Electric Light Plant	9
Electrical Work in the Navy	9
A Convenient Tool for Linemen	9
Electric Lighting Done by the Westinghouse Company	9
Electric Light News	9
Kindred Interests	10
Shultz's Patent Leather Covered Pulleys	10
Electrical Patents	11

The REVIEW extends the season's compliments to its friends, and wishes them one and all a merry Christmas and happy New Year.

The United States Supreme Court has again decided, for the fifth or sixth time, that a State has no power to tax a telegraph company on business transmitted from one State to another.

C. E. Mitchell, the Commissioner of Patents, has rendered a decision in the case of Elisha Gray vs. James H. Robertson, in which he holds that no interference exists between the inventions. The interference proceedings are accordingly dissolved. The controversy related to telautograph systems or systems in which written messages are reproduced by electricity.

Journalist Joe Howard well says: "The destruction of sound arc lamps may make the groundlings hurrah, but later on the judicious taxpayers will grieve."

The "choppers" of New York hacked down a pole that was properly located and its wires all right, giving as a reason that the pole was not painted exactly the right tint. What idiocy!

A reporter with a fertile imagination recently wrote a hair-raising and blood-curdling description of what might be expected should an electric wire come in contact with the elevated railway. In his mind he saw the startled engineers opening the throttles wide and running the engines over the house tops, leaving destruction and death and red-hot cinders in their path, the result of an electric shock from the bottom of the cab. It is a disgrace to intelligent journalism that such stuff should appear in a leading New York daily.

In its very interesting article on "Torpedo Boats" last Sunday, the New York *Sun* gave a description of some ingenious plans for construction and operation of submarine boats. The chief obstacle mentioned is lack of speed, it appearing that none of them attain more than 10 knots per hour when at service submergence. The writer on the *Sun* however omits the best work so far done. For his benefit we may say that the Sims-Edison fish torpedo has in practice attained nearly 23 miles per hour at service submergence, and while unarmored is unsinkable. It can plant with unerring accuracy a torpedo containing 200 lbs. of emmensite (equal to 500 lbs. of dynamite) against the hull of the enemy. It is worked entirely by electrical energy and therein lies its greatest advantages.

"HIT HIM AGIN—HE'S A DUTCHMAN."

During the Know-Nothing times it used to be the motto of that so-called national organization to strike wherever there was a head, if evidence was present that the head came from over the sea. The sensationalist of to-day seems to look upon electrical applications, and especially electrical power and illuminating currents, as aliens and heathen.

The fire in Boston, while leaving in its track some evidence of wild current skirmishing along wires which did not belong to it, has not thus far shown any better proof that this condition was a cause than that it was a result of the fire. Prejudice apart, is it not an even chance that falling wires may have crossed and thus endangered other localities after the fire had got under way?

In the Minneapolis fire, too, the same sort of conclusion was jumped at in the hurry and smoke, and the electric current was made to carry the false accusation of its criminality all over the world.

A short time since, an item was written up by a gullible reporter, of a party being severely shocked and doing considerable high and lofty gymnastics, on account of having become foul of an electric light current. Now, the plant which has wires at that point has none but night circuits, and the dance took place in daylight. The man was drunk, and the job was set up on the reporter by an unfeeling wag.

A fire recently occurred in an establishment in which a motor was the only user of an incandescent current. The current was switched off at quitting time, and the proprietor remained in the room for 15 minutes afterward. An hour and a half after he closed the house and went home, the fire declared itself and was supposed—there being no other cause apparent—to be an electric fire. Yet, when an investigation was made, the ampere strips from the steel main were found intact, and one of the strips on the motor cut-out was not melted. More than that, the resistance coils were unburned, and all the marks of heat at the cut out screw-heads showed plainly that it came from an outside source.

Ah, well! as long as the public demands a sensation with its daily breakfast, and electricity furnishes this with comparatively little effort, the proof of innocence, as in the case of the Salem witches, is sometimes difficult of accomplishment.

ELEVATORS OPERATED BY ELECTRICITY.

One of the most important of the applications of electricity to mechanical contrivances is the adaptation of electric power to house, store and office building elevators. The general public are probably brought into more intimate contact with this class of machinery than almost any other, and much energy and brain work have been expended to produce mechanical devices which are practical, safe and economical in the consumption of power. In the past year electricity has been applied in numerous instances to the operation of the main valve of an hydraulic elevator by the use of small unbalanced auxiliary valves operated by electro-magnets connected to push-buttons or a switch in the car. In many cases these devices give good satisfaction, but it is apparent that with the substitution of balanced valves, independent of the water pressure, even better results could be obtained.

For some time past considerable activity has been exercised among experts in the endeavor to produce a suitable adaptation of electrical power and principles to the already well-established principles of the modern elevator. The decrease in the number of isolated steam plants, owing to the substitution of electricity, has been so marked in the past few years that engineers have been led to see the direction the march of its progress has taken, and the necessary increase in the rapidity and length of its strides in the next few years.

The advantages of an elevator operated entirely by electricity are numerous, and inasmuch as the elevator is of vital importance and constant expense to a building, these advantages will necessarily be of interest to owners.

The first cost of a well designed electric elevator is apparently below that of any other form of elevator with the necessary engine attached to run it, for in a recently invented elevator the application of electricity to the automatics has stripped the machine of much of its complexity. Its economy to operate is undoubtedly pronounced when we consider that the consumption of coal to develop one indicated horse power in the average steam plant in buildings is from six to ten pounds per hour, and in some cases even more, while with central stations for the generation of electricity, equipped with modern triple expansion engines and located along a water front where the engines could be made condensing, a horse-power can be developed with an expenditure of about 1.5 pounds of coal per hour or less than one quarter the present cost. A company with such stations could furnish power for much less than individual owners could afford to produce it.

Other advantages are the absence of high pressure steam and its attendant dangers, in many cases the entire absence of a boiler with its repairs and the utilization for other purposes of its floor space, and the ability to do away with a licensed engineer. In this class of machine advantage can obviously be taken of balancing the car from the winding drum, a feature of much economy.

Possessing these advantages, many new fields, such as small apartment houses, small stores and private dwellings, will be opened to the electric elevator.

A gasometer blew up at Asheville, N. C., last week, and killed two men. The city was left in darkness.

The suit against Bell's telephone patent is again in court at Harrisburg, Pa. We will probably hear the last of these suits in 1892—the date the patent expires.

Mr. Edward H. Johnson, the well known president of the Edison Electric Light Company, has assumed the duties of president and general manager of the consolidated Edison and Sprague motor interests. His great energy and earnestness will be felt in electrical power circles and will be of particular value to the Sprague interest.

The funeral of Miles W. Goodyear occurred Thursday of last week in Masonic Temple with full ceremonies of the order. One of his comrades during four years of the civil war spoke feelingly of the esteem in which Mr. Goodyear was held by his fellow-soldiers, his bravery and kindness. There were a number of the friends of the deceased present from the Electric Club. The remains were taken to Connecticut for interment.

ELECTRICAL NEWS.

What is Transpiring in Electrical Circles in the Leading Cities.

OUR WASHINGTON LETTER.

Important to Inventors and Owners of Patents.—On the 16th inst. Senator Teller introduced in the Senate a bill which, if passed, will have a very important bearing on the interests of many readers of the REVIEW. The bill, which was referred to the Committee on Patents, provides that all patents heretofore or hereafter granted for discoveries, inventions processes and improvements are for the active use of the public, subject to the rights of the inventor, discoverer or assignee to receive the consideration thereof, and must be put into actual use. A failure to put the same into actual use within five years from the date of issue shall be held to be an abandonment, and thereafter the thing patented shall be public property and the patent *ipso facto* void. Also that the exclusive right secured to the inventor or his assignee is to promote the progress of science and useful arts by compensating inventive talent and labor through a reasonable return for time and money expended, but not for the purpose of permitting excessive charges for the right to use nor of promoting fictitious issues of bonds, stocks or other evidences of interest through incorporated companies or voluntary associations, nor of promoting combinations of manufacturers, producers and others for restricting trade or production, or controlling prices arbitrarily because special advantages are held through patents issued by the United States.

All persons and corporations are forbidden to enter into any combination or stipulation, by writing or otherwise, to control prices or production when the article produced or process used is partially or wholly covered by, or the result of, the issue, ownership, or control of United States patents. Any person offending against the foregoing provisions shall be punished by a fine of not less than $1,000 nor more than $10,000 dollars, and imprisonment not less than six months, in the discretion of the court. The Attorney General is charged with seeing that this law is obeyed, and required to take the proper proceedings in the Circuit Court of the United States, on the complaint, under oath, of three reputable citizens who shall be taxpayers of the community where the complaint shall be verified. All proceedings under this act or resolution shall be of a summary nature.

A Slap at the "Devil."—I have always doubted whether the right person in the newspaper office is named after his satanic majesty, and, since the types made me say, in the last REVIEW, that the machine invented by Edison was called a "photometer" instead of a phonomoter, I am convinced that he is not. The name given in the patent referred to, No. 210,7o7, is "vocal engine," but Mr. Edison called it a phonomotor.

The Electric Heat and Power Company of the United States, which is the local representative of the Westinghouse interest, proposes to make a five year contract with the District of Columbia to furnish arc lights of the Waterhouse system, of 2,000 candle-power per lamp, at 50 cents per lamp per night, and incandescent lamps of the Westinghouse system, of 25 candle-power, at $16 per annum, the lights to burn 2,600 hours during the year, provided the privileges now enjoyed by the present electric light and gas companies in regard to private or commercial lighting be extended to them. The company will construct cement-lined conduits, manufactured by the National Conduit Company, of New York, and lay the Standard Underground Company's lead covered cables, and will cover a large portion of the city not occupied by the present company.

The United States Electric Lighting Company, of Washington, has recently authorized an increase of its capital stock from $500,000 to $700,000. Notwithstanding the extraordinary outlay which the company has been compelled to make in changing its lines, from poles to conduits, it has continued to pay six per cent. dividends and the price of its stock has advanced from 60 cents to par within the last 18 months. The additional sum provided for will be needed to meet the rapidly growing demand for lights and for motor currents. The owners of many private residences, as well as of business places, are clamoring for incandescent lights and will have them put in just as soon as current can be supplied. Many of the houses built during the past two years were wired when constructed. It is expected that a large increase in the number of public street lights will be made provided legislation permitting the necessary extension of underground wires is not impeded. There are also frequent inquiries for motors from persons outside of the field covered by existing lines. Gas engines have been displaced by electric motors in many instances and the demand for the former has become very small. About six miles of streets are now lighted by arc lamps which have displaced 460 gas lamps. Owing to the natural growth of the city, the improvement of new streets, and the education

of the people up to a higher standard of illumination, the number of gas lamps has not decreased. The number now in use is 5,500. There are not less than 50 miles of streets and many public parks in which electric illumination could be advantageously and profitably used. Owing to the large area of the city and the scattered condition of the buildings, it would be expensive to light all parts of it from one station, but there are numerous suitable locations where land is cheap and transportation of fuel, etc., convenient. The local company is making strong efforts to secure contracts for lighting the more important goverment buildings, while isolated plant advocates are not unmindful of the advantages which may be gained from active work in that direction.

Fred Royce is a Father-in-Law.— Miss Kate D. Royce, daughter of Mr. F. W. Royce, of Washington, was married to Mr. Joseph S. Latimer on the 17th inst. The wedding ceremony at the Epiphany Church was very impressive and appropriate, and was followed by a delightful reception at the residence of the bride's parents.

Storage Battery.--Representatives of the Sorley storage battery are in Washington for the purpose of organizing a local company to introduce the battery in that vicinity. G. C. M.

Washington, Dec. 20.

OUR BOSTON LETTER.

Boston Electric Club.—Members and their friends will be entertained this evening with a paper entitled "An Inquiry into the Covering of Steam Pipes, Boilers, etc., to Prevent Loss of Power by Radiation of Heat," read by Mr. F. C. Childs, of the firm of Nightingale & Childs, at the Club Rooms, 7 Park street.

All Electric Routes —Within a few days, when the northern depot electric line is put in operation, many changes in the routes of cars on the West End railway will be made. Arrangements will be perfected whereby the horse and electric cars running on the same lines will not interfere with nor be delayed by each other. When the entire line from Dorchester to the Tremont House, and from Grove Hall to the northern depots is in operation, stopping places will be designated where motor cars will take and leave passengers.

Gloucester.—The board of aldermen, on Wednesday night, gave a hearing to the Gloucester Street Railway Company, who petition to use the single trolley system. Edgar S. Taft appeared for the railway company, and S. L. Powers for the New England Telegraph and Telephone Company. Several expert electricians were present and explained the workings of the various systems. George W. Mansfield, of the Thomson-Houston Electric Company, when questioned by Mr. Powers, who drew his attention to the accidents caused by electricity as reported daily in the papers, said he did not believe they knew what they were publishing.

Mayor Hart has just returned from a visit to New York, Philadelphia and Chicago, where he went to make inquiries in regard to electric wires. In New York he found things in a generally demoralized condition. In Philadelphia he learned that all electric wires are erected and maintained under official supervision, and there have been no serious accidents for four years. The electric light wires are carried in conduits and work satisfactorily. In Chicago most of the overhead wires had been taken down. The city owns an electric light plant which has 300 lights, and will soon establish three more plants, each with a capacity of 1,000 lights. The city electrician requires that an absolute switch be placed on the outside of each building into which wires enter, to be used for power or lighting purposes.

The Wire Question still attracts close attention and interest. The city government is thoroughly aroused, it seems, and some beneficial results will come from their action. There seems to be some doubt as to the authority in the matter, and it has been suggested to have the Legislature at its next session pass a statute which shall confer on the city government the requisite authority. It is believed that there would be no hesitation shown by the Legistature in passing the enabling statute, and that before three months have passed system and order can take the place of the chaos in which the electric wire system now rests.

The Electric Cars in Boston seem to be more successful in contending against sudden snow storms than are those cars drawn by horses. A great deal of credit is due to the new electric sweepers and snow plows, which are well-nigh perfect in their action.

Electric Cars on the West End Road.—The number of electric cars equipped by the Thomson-Houston Company for the West End Company is now about 85. These are all equipped with two motors each, which, together with the running gear, also furnished by the Thomson-Houston Company, cost something over $3,000 apiece. A minimum estimate shows that the Thomson-Houston Company has received, or is entitled to receive from the West End Company, about $255,000 thus far for car equipment alone. Under the contract, in addition to the amount received for car equipment, the Thomson-Houston Company receives revenue from the stringing of wires, furnishing electrical appliances for overhead arrangement and a car mileage. The number of cars now in use by the West End Company is about 1,800. It cannot be estimated how many will be electrically equipped, as the number of tow-cars necessary is unknown. At present the Thomson-Houston and West End Companies are jointly at work perfecting an electric locomotive. If this is successful the number of electric cars equipped with motors in the future may be limited. In answer to the question as to how many cars this locomotive could draw, a gentleman acquainted with the management of the West End said that "two cars would be all that would be practicable for a surface road," which strengthens the idea that the West End Company is looking forward to an electric elevated road at no distant time.

Mayor Hart met representatives of several of the Boston electric light companies in conference at the City Hall on Friday afternoon, in answer to his call for proposals for lighting the city. The bids of the different companies varied from 49 to 65 cents per light per night, the latter figure being bid for all of the city proper. The Roxbury and West Roxbury price is 49 cents; in Charlestown 50 cents is asked, and in Brighton 57 cents. Mayor Hart refused all the bids and will probably call for more. He intimated that he had a pretty good knowledge of what electric lighting ought to cost. It is quite generally claimed by the companies that they cannot afford to furnish light for less than they have agreed to.

Braintree.—The Braintree Street Railway Company has been organized with a capital of $25,000, divided into 250 shares, with a par value of $10 each, all of which have been subscribed. The road will extend between Braintree and Quincy, a distance of seven miles. The motive power will be electricity.

Boston, Mass., Dec 24. S. L. C.

OUR CHICAGO LETTER.

The Pumpelly Storage Battery Co. have just placed a new size, new style, battery on the market for use with the phonograph. The battery is about 8x8x6 inches and has a capacity of 30 amperes.

The above company have just installed a plant for the Western Electric Co. in their factory. It consists of 60 large cells.

The Central Electric Co.'s new quarters on Franklyn are rapidly nearing completion. A large force of men, including wiremen, carpenters and plumbers have been at work for some time past. The present intentions are to move the 10th of January.

From the present outlook these will be one of the finest suites of offices in the country. In their new quarters the above company have the best wishes of the writer for a successful new year.

Personal.—Wm. H. McKinlock, president of the Central Electric Company, returned this week after an absence of ten days in the East.

Mr. Walter K. Freeman and Carl Kammeyer, of the National Electric Company, spend Monday in the city.

The Eau Claire Street Railway Company lately adopted the Sprague system on the road and are now successfully operating six cars. The road has given the best of satisfaction since its start. It has a great many curves and considerable grade in a number of places.

The Electrical Supply Company, Chicago, who have received the Western agency for the Electrical Conduit System for interior wiring, have placed Geo. T. Hewes as their sales agent in this department. The company are vigorously pushing the sale of this system and have recently closed some large and important contracts, prominent among which is the palatial residence of Clem Studebaker, of South Bend, Ind. Mr. Studebaker's residence will be equipped throughout with this system for incandescent wiring, and will be a model of convenience and safety in this respect. The Electrical Supply Company have the utmost confidence in the future of conduits, and already report large sales and an increasing demand and constant inquiries.

The Underwriters Hatch Door Co., Chicago, report a constant increase in their business. They have placed over 1,800 doors in this city.

The system as used by this company is the placing of automatic doors in elevator shafts which are held in an upright position by electric locks. Thermostats are placed at intervals along the electrical circuits, both without and within the shaft. In case of an increase in the temperature the doors are electrically released and drop, closing the shaft at each floor, thereby shutting off the draft. D. B. D.

Chicago, Dec. 24th, '89.

The cutting down of wires in New York City still goes on. The streets are in darkness except where, in a few instances, gas lamps have been put up. Many miles of valuable wire have been "confiscated" by the city

A Letter from Prof. Rowland, of Johns Hopkins University.

TO THE EDITOR OF ELECTRICAL REVIEW:

Dear Sir:—In your paper of Dec. 14th, you most kindly mention my name as being among those who are about to visit Kansas City next February.

Like a knight of old I am supposed to stand forth and meet all comers who are to charge down upon me with all their most difficult questions.

There is evidently some mistake, for I certainly did not intend to pose as a champion of this kind, especially in a subject of such a practical nature. Should I go to Kansas City, which my duties here may prevent, it will be more to learn than to teach, although if theoretical questions should come up, I might have a word to say with reference to them.

Yours sincerely,

HENRY A. ROWLAND.

Baltimore, Md., Dec. 20, 1889.

Another Subway Explosion in New York.

A tremendous explosion occurred in the subway manhole at Twenty-ninth street and Sixth avenue at 6 o'clock last Saturday evening. Simultaneously with the explosion, which alarmed the entire neighborhood, a column of flame shot up from the manhole to a height of 15 feet or more, and the heavy iron cover was thrown high in the air, descending with a crash and alighting nearly in its proper place. For a space of a dozen feet in diameter surrounding the manhole the pavement was dislodged, and those nearest to the manhole were thrown a considerable distance in every direction.

The manhole is situated on the west side of the avenue and about the center of Twenty-ninth street. The sidewalks and crossings were crowded with pedestrians and the street and avenue were filled with vehicles, and it was a miracle that no one was seriously hurt. Dr. S. Newton Leo was crossing Twenty-ninth street at the moment of the explosion and was struck on the foot by one of the flying stones, but fortunately sustained only slight injuries. A. E. Vass, who was walking close to Dr. Leo, had his silk hat smashed by a stone.

The noise of the explosion drew an immense crowd to the scene and traffic was blocked for a time. The wreck was inclosed with barrels and planks, and the Subway Commissioners were notified of the accident. The explosion is believed to have occurred by the ignition of escaped gas.

PERSONAL.

Mr. R. F. Outcault, who was with the Edison exhibit at the Paris Exposition, has returned to this country well pleased with his six months in Paris.

Mr. John P. Barrett, city electrician of Chicago, visited New York last week. Like many other Chicagoites he thinks the World's Fair will go to the city on the prairies. Mr. Barrett is proud of the fact that they do not have fatal accidents due to electric lighting in his city.

Monsieurs J. Seligmann-Lui and G. De La Touanne, of Paris, are two prominent electrical engineers who are visiting this country for the purpose of investigating electrical work. They will make their headquarters with the French Legation at Washington, and at the Electric Club, New York.

Mr. Chas. Cohen, who will represent the Thomson-Houston Company at Cape Town, South Africa, was a visitor in New York last week, sailing Saturday for London. In starting in to light up the "Dark Continent," Mr. Cohen has undertaken a great work, in which he will be ably backed by the International Thomson-Houston Company, of Boston.

Mr. J. D. Bishop, who so ably assisted Mr. W. D. Sargent in representing the American Bell Telephone and the Western Electric Companies at the Paris Exposition, and who has had entire charge of the exhibits since Mr. Sargent's return, arrived in New York last week, and will make this his home. Mr. Bishop was recognized as one of the ablest of the American representatives, and being familiar with French customs, having lived in that country a number of years, and speaking the language fluently, was called upon as chief speaker at all the meetings and dinners at which American interests were represented during the Exposition.

THE ELECTRIC CLUB.

RESOLUTIONS IN MEMORY OF THE LATE VICE-PRESIDENT E. N. DICKERSON AND M. W. GOODYEAR—PRESIDENT GILLILAND COMPELLED BY ILL HEALTH TO RESIGN AND GEN. O. E. MADDEN ELECTED.

The last meeting of the Board of Managers of the Electric Club, New York, had the mournful duty of recording the death of two of its members. Expression of the sentiment of the Board was given in the following resolutions:

Resolved, That in the death of Vice-President E. N. Dickerson the Electric Club loses a valued and highly esteemed officer, a gentleman of great ability, scientific attainment and vast general information, and whose kindly nature made him the friend of everyone and everyone his friend who had the pleasure of his acquaintance.

Resolved, That in the death of Miles W. Goodyear this Board has lost one of its most earnest, intelligent and popular coworkers; one who has ever labored enthusiastically for the best interests of the Club which he helped to organize. We found him ever faithful and true, and keenly and deeply regret our loss.

Resolved, That these resolutions be spread upon the minutes of the Club, and a copy of the same be suitably engrossed and forwarded to the families of the deceased, and also that copies be furnished to the principal electrical and scientific papers.

Mr. J. C. Chamberlain was unanimously elected member of the Board of Managers and appointed chairman of the House Committee, a position long acceptably filled by Mr. Goodyear.

A letter was presented at this meeting from President E. T. Gilliland, who has been quite ill for several weeks, in which he stated that his physician had ordered a complete rest, and he was, therefore, compelled to tender his resignation. Mr. Gilliland expressed his deep interest in the growing success of the Club and its future work, and pledged financial aid for its advancement. The following resolution was unanimously adopted:

Resolved, by the Board of Managers of the Electric Club:

1st. That we learn with extreme regret of the illness of our honored president, and while accepting the resignation which his illness compels, we desire to testify to our appreciation of his earnest work in behalf of the Club, and to express our thanks for the substantial subscription which accompanies his letter of resignation, and which is only one of many favors the Club has received from him. We sincerely hope for his early restoration to health.

2d. That, desiring not to lose Mr. Gilliland's valuable assistance on this Board, should he be able to meet with us on his return from the South, we unanimously ask him to remain as a vice-president of the Club.

Gen. O. E. Madden was elected president of the Club by the managers. While the REVIEW sincerely regrets that Mr. Gilliland's poor health compels him to retire, we are pleased to see the vacancy filled by a gentleman of Gen. Madden's ability and popularity. The new president is well known in electrical circles, was one of the founders and promoters of the American Bell Telephone Company, and is at present at the head of large electrical interests in this city and elsewhere.

Some changes and improvements in running the Club house are under discussion by the House Committee. The number of non-resident visitors at the Club is growing, as the conveniences of the Club in this respect are quite generally recognized.

The next lecture before the Club will be Thursday evening, January 16th. Prof. Chas. R. Cross, of the Massachusetts Institute of Technology, will deliver the address, and has taken for his topic "Some Acoustic Principles of the Telephone." Apparatus will be used for illustrating the lecture.

Mr. John Carroll, formerly in charge of the Newport Telephone Exchange, has accepted the position of secretary-treasurer of the Eugene F. Phillips Electrical Works, Limited, Montreal, Canada. Mr. Carroll is an experienced telephone man, familiar with wire and cable work, and will be a valuable and energetic addition to Mr. Phillips' staff. The Montreal works are succeeding finely, the business for this month being particularly large and important. It was evidently a wise move on the part of this most successful insulated wire and cable manufacturer to open a Canadian factory.

Telephonic News

*** A company has been organized to build a telephone line from Sunbright, on the C. S. road to Sparta, Tenn.

*** Messrs. O'Sullivan, Phelps and McClintock, the special committee appointed by the lower house of Kansas City to investigate the question of alleged discrimination in telephone rates, will soon present its report, which is under preparation, says the *Times* of that city. The committee will report that the charter gives the council the authority to legislate in the matter of telephone rates, while the State law gives it the power to control the location and erection of all telephone poles. The report will recommend that further investigation be made by the ordinance committee of the lower house.

From an Impatient Telephone Subscriber.

I called, I waited—
One hour goes by.
A ring. I sigh.
They are "busy, good-by."
I fainted. Hu.

[The above is a good example of the exaggeration that is apparently universal among telephone complaints. The truth—not the poetry—no doubt is that the above poet had only to wait until the operator could communicate, either by test or through another exchange, with the line wanted. Of course it was her fault that it was "busy!" The subscriber should know better than to use his telephone himself—it should remain idle for the sole use of incoming messages.]

The Telephone and the Gout.

The parish clerk in a Norfolk village, England, being prevented by rheumatic gout from attending church, has been very kindly presented by the manager of the telephone company, who lives in the same place, with a double telephone, which is fixed from the church to the old man's cottage, so that he and his wife can hear and follow all the services. The old man is quite unable to hold anything, so the telephone is arranged in such a manner that it fits against both his ears. He can hear everything in the church quite clearly; if a book is dropped or if anyone coughs the sound is as distinct as though he were in the building.

The New Induction Theory.

The technical press of Europe quite generally republishes Mr. J. J. Carty's Electric Club address, and comments upon it in several instances. The title of the address was "A New View of Telephone Induction," and the *Electrician*, of London, speaks of it as follows:

"In another column will be found some 'new views' upon telephonic disturbances by an American electrician. His experiments present several points of interest and of practical importance. The particular trouble to which our cousins give the quaint but expressive name of 'cross-talk' is known in this country, and particularly in London, by the more high-sounding but less expressive name of 'induction.' As it happens, however, the greater part of the so-called induction troubles in London are due to a conjunction of two causes with which neither electro-static induction nor electro-magnetic induction has anything to do, namely, a moist and smoky climate and the absurd use of shackle insulators at all possible places along the line. In other words, leakage, through films of dirt accumulating upon insulators of a wholly unsuitable pattern, is the real culprit.

"Another cause of cross-talk, not alluded to by the author of the paper in question, doubtless plays its part in the troubles usually assigned to 'induction.' We mean the practice of providing a common return through earth for all the radiating lines of a system. If the currents sent through a line flow back via the earth, what is there to hinder a fraction of them from finding their way back through any convenient neighboring line which likewise goes to earth? Indeed, this is what one would expect to occur. Metallic circuits, with clean insulators of a rational pattern, are singularly free from cross-talk. But the telephone folk throw the blame upon 'induction' for all the faults inherent in their system."

The Tariff on Copper.

A committee of the National Electric Light Association will make a report on this matter at the Kansas City Convention. The chairman of the committee is Mr. C. A. Brown, of Chicago, and a recent letter of his sent to the REVIEW in reply to questions, contains the following interesting information in regard to the matter which we take the liberty of publishing:

"The duty on copper is as follows: Imported in ores, 2½ cents per pound on fine copper; old copper, 3 cents per pound; copper in plates, bars, ingots, etc., 4 cents per pound; in rolled plates, sheets, rods, etc., not especially provided for, 35 per cent. ad valorem.

"The abolition of the duty on copper in its various forms would benefit every one, except possibly the mine owners. What these benefits will be, I will state at some risk of repeating what I have already said in the article which you published in your paper and in various other articles which I have written on this subject.

"We are habitual exporters of copper, therefore the duty on copper brings in almost no revenue to the United States Government. The sole effect of the copper tariff, therefore, is to enable the mine owners to advance the prices for their own benefit. That they have not been slow to take this advantage, which has been offered to them, is evidenced by the fact that the American price has been uniformly higher than the English price. The result is that Lake Superior copper, when selling in Connecticut, for instance, at 18 cents, sells in London at two or three cents per pound less; and it has happened that Lake copper has gone all the way to London and, after being sold there, has been re-transported to New York, when, after paying the duty, it has met in competition copper from the same mine which has reached the market by the shorter and less expensive route of the Lakes and Erie Canal.

"Under the influence of the tariff, copper has always been and is now higher in this country than elsewhere, although copper can be produced in this country cheaper than anywhere else in the world. The direct result of this, of course, is a tax on all copper consumers for the benefit of copper mine owners.

"Copper is now at least two cents per pound higher in the United States than it is in London, and as it is estimated that the electrical industries are now using not less than 600,000 pounds of copper in its various forms per month, you can readily see what a tax the electrical interests are submitting to on account of the duty on copper.

"In a recent report on the copper situation in *Bradstreet's* there is a statement that 'the leading companies put their copper on the market at a total cost of six and nine cents per pound.' It is well known, moreover, that Lake copper is landed in New York at six cents per pound, when, therefore, this copper brings 18½ cents per pound in this country and 11 cents per pound in London, the effect of the tariff can be appreciated.

"The movement in favor of the abolition of the duty on copper is not a free trade measure; it is not a partisan measure in any sense except that it is in the interest of the party to which the electrical industries belong, that large party which is interested in copper as direct or indirect users of the metal, therefore the movement in support of the abolition of the duty on copper is favored by free trader and protectionist alike."

The Hottest Spot on Earth.

[*From the Boston Herald.*]

The hottest region on the earth is on the southwestern coast of Persia, where Persia borders the gulf of the same name. For 40 consecutive days in the months of July and August the thermometer has been known not to fall lower than 100°, night or day, and to often run up as high as 128° in the afternoon. At Bahrin, in the center of the torrid part of the torrid belt, as though it were nature's intention to make the region as unbearable as possible, no water can be obtained from digging wells 100, 200 or even 500 feet deep, yet a comparatively numerous population contrive to live there, thanks to copious springs, which break forth from the bottom of the gulf, more than a mile from shore.

The water from these springs is obtained by divers, who dive to the bottom and fill goatskin bags with the cooling liquid and sell it for a living. The source of these submarine fountains is thought to be in the green hill of Osman, some 500 or 600 miles away.

DELAYED DISPATCHES—A CHRISTMAS SKETCH.

Sergeant Worden: You have my permission to tell the story of that Christmas time in 1862, but in such a way as to reveal the identity of none of the participants. I can trust to your judgment to so transpose the incidents into new localities and place the actors under new names, as not to disclose the ridiculous position I occupied in the story. BREVET MAJ.-GEN. HOBBS.

I will give the story, then, in the general's own words, as I recall them through the haze of years and the odorous haze of cigar smoke in the club room, where he smilingly told me the simple story, but a story of interest as shedding some side light on a troublous time in our national history. He said:

"I was in temporary command of a corps of the Army of the Cumberland, and my headquarters were at Nashville, Tenn. To say that the prospects of the Union army were dark at that time conveys only a faint picture of the utter discouragement felt by the whole army. The unusually cold December, which we seemed to have brought with us from the North, caused our men to crouch and shiver on their guard-posts, and a look into the hospitals revealed our wounded cowering on illy-covered barrack beds, while the rattling windows were covered with soldiers' blankets to keep out the raw wind so seldom felt in middle Tennessee. The exhilaration of the dawning year 1862, with its gilded hopes irradiating the victories of Mill Spring, Bowling Green, Donaldson and Henry, had faded away in the autumnal gloom of lesser though continuous defects all along the line. December came in on scattered and watchful groups of the Western army brooding over a phase of war totally unexpected and seemingly unprepared for. The South had developed its wonderful cavalry tactics. Wheeler had sprung like a tiger on weak points, and left devastation and ruin among our slow-moving but brave infantry. Forrest had gone flashing like a meteor along our line of communication, leaving smoking ruins where of late stood our rich stores of bread and meat for the sustenance of waiting men at the front. Outposts of our infantry had arisen in the morning to find themselves surrounded, and the formality of laying down their arms and signing their paroles was all they had to do to complete their shame. Trenton, Humboldt, Union City fell before Forrest and his brigade of laughing, singing, but victorious raiders. John H. Morgan, the subject of laudatory song in play-house and camp—truly a marvellous, wily, and brave man, whom it is no shame to praise now that his name is passed into history, howbeit at one time our mortal dread and enemy. Morgan, who mounted his men on blue-grass racing stock, and solemnly gave in exchange his sore-backed, worn-out steeds. Morgan, who sat in the parquette of the old Cherry Street Theatre in Nashville, surrounded by a thousand Union soldiers, and heard a song about himself; yea, and laughed and applauded when Charley Everett sang 'John Morgan's got yer mule.' Aye, that was the material composing the raiders who sent sorrow to the heart of the Western army on this 1st of December, 1862.

"My daughter had arrived a month before via Cincinnati and Louisville, and had given a sunny gleam to headquarters life. Mamie was only an ordinary girl. I am her father and I ought to know. She was only a healthy, good-natured, romping father's girl. A little given to slang and very much given to horseback-riding, and sat on a captured white filly and watched brigade drill and review, and I suppose caused a terrible raid on sutlers' stores for perfumery and new uniform braid and shoulder straps. My staff, of course, were all on their good behavior, and shoes were carefully blacked and spurs polished, which had been considered good enough for the old general before her arrival. Her demure acceptance of escort on her rides and the flourishing of cambric handkerchiefs by the officers as they rode away, made old John Luark, of Mexican war experience, remark that headquarters looked like a bloody Down-East seminary. What smote upon my fatherly heart as a peculiar aggravation was the preference evinced by Mamie for a young Kentucky colonel acting as chief of my staff. Colonel Barton was not over five feet and six inches in height. Add to that the fact of his having stooped shoulders and inordinately long arms, and you will see why I was astonished at Mamie's apparent preference for Barton's society. But if you saw Barton's face alone you wondered at its strange, pensive beauty. Dark, deep eyes of brown, a drooping, black mustache, and a wide, white forehead surmounted by curls of the same hue as his eyes. Looking into his face and forgetting his form, you could imagine him an Arthur or a Bayard; but looking on his form as he moved before you, you would pity him. On horseback he was a Napoleon First. Well, I gave it up. Mamie, the romp, in love with a pigmy; perhaps there is an aptness in this, for a woman will love and fear, or love and baby and caress a man, so philosophers say. I am no philosopher. Barton had his history, too, or he could not be colonel at twenty-eight and chief of my staff. That history had to do with proscription by his Southern friends, a midnight flight to escape lynching, and the organization of a regiment of cavalry authorized by an autograph letter from Lincoln himself. A tiny scar across the white cheek told of suppressed history in his life, when his opinion of State rights and Union had to be defended by pistol or sword.

"Thus we were situated December 1st, 1862. When on that morning Barton entered my room, I held in my hand a private dispatch from General Halleck. I said:

"'Would you like to hear this dispatch, Barton?'

"'If you please, General.'

"I read:

"'WASHINGTON, D. C., December 1st.

"'GENERAL: Have you any cavalry in your command? We must counteract influence of Forrest and Morgan. At any sacrifice attempt a raid.

"'HALLECK, Major-general commanding.'

"'What do you think of that, Barton?' I asked, in a grumbling tone.

"'Splendid,' said Barton; 'it is just what I have felt for some time.'

"'But,' said I, 'we have no cavalry.'

"'No, General; but we have horses and men, and they can be made into cavalry,' and Barton smiled.

"'No one has ever demonstrated it with us, Colonel,' said I.

"'Begging your pardon, General, I will attempt it if you give me the order,' said Barton.

"'You?' I asked.

"'Yes, I;' and he blushed and looked down. 'Give me my old regiment and two others like them, and I will do what Halleck wants, viz: show the South that their line of communication is in as much danger as ours.'

"'How will you be supplied on your raid?' I asked.

"'How are Morgan and Forrest supplied?' Barton asked.

"'By George! they live on what they capture, and get fat at it, too,' said I, angrily.

"'I will do the same,' said Barton, quietly.

"It began to dawn upon me that he was right. This is what Sherman afterward demonstrated in his march to the sea, and what Sheridan demonstrated when with his cavalry he passed clear around Richmond.

"'Barton,' said I, 'I am going to give you a brigade of cavalry instantly, and with it an order to start out as soon as possible and cross the Cumberland Mountains and follow Halleck's order. By jove! give them dash enough if you do not bring back a man. A counter-irritant must be applied to lift the hearts of our men or we shall die with the blues. Strike up through Cumberland Gap, strike Union City, burn a bridge or two on the East Tennessee railroad, and strike anything or anywhere, and keep striking until you run down like a clock. Let me see; I can wire you at Clinch's if I want you to go on or turn back. Ah, if you only had more experience!'

"'Yes, sir; I wish I had;' and he blushed and looked down. Then he straightened his slight form, and looking me in the eye, said, in a firm tone: 'I thank you, sir, for the commission. I shall give you a good report to send to Halleck or a chance to write my obituary. I shall have a double motive in this raid, sir. I am a Southern man, sir. I love honor. I also love your daughter, sir. If these were not troublous times, sir, I could give your daughter a good home and place her among equals. As it is, sir, have I your permission to offer my regards and my fortune to Miss Mamie, sir?'

"I smiled at first at the 'sir' so often repeated in the Southern manner, and the other evidences of Southern breeding. Then I grew angry, and asked, hastily: 'Have you addressed my daughter on the subject, Colonel?'

"'No, sir, I have not.'

"'Then do not. I will sound her on the subject and wire you in the Gap at our last station. Colonel, I know but little of your history, and ask that you say nothing to Mamie before your departure.'

"'I am a gentleman, sir.' He bowed and passed out to take the northern train to arrange for his raid.

"Mamie came into my office a few days later, and after peering out of the windows and tumbling over the papers on my desk, remarked, with her face turned another way, and with affected carelessness:

"'I do not see Colonel Barton about any more, pa.'

"'No,' I said, scribbling away on signatures to returns; 'he is gone on secret service, and will be gone several weeks. I trust the little man will acquit himself well.' This with a covert sneer.

"I heard a Japanese paper-cutter break in her hand when she answered:

"'You had plenty of big men to send, if beef and bone constitute soldiers. Why didn't you send one of those Ohio horse-killers?'

"'When did you become proficient in staff work and get such an interest in army affairs?' and I whirled my chair square around to face her.

"'Oh, pa, how can you!' with a quaver in her voice—almost a sob if I knew much about women, but I never had but this one girl. Aha! there was more to this affair than I supposed.

"Mamie continued to ride out with the horse-killers, as she called the large, florid Western staff officers, but she led them such rides that their trousers were pushed up to their knees and their feet half the time out of the stirrups and their horses completely blown. Mamie was certainly not good company for young men that month. It was time for me to send my first dispatch and nip this affair in the bud. I stepped to the instrument and ticked off this message to our last station in Cumberland Gap:

"'NASHVILLE, Dec. 10th, '62.

"'COLONEL BARTON: I totally disapprove the union proposed. Govern yourself accordingly.

"'HOBB'S, Gen'l Com'd'g.

"'*Dispatch to follow.*'

"Then I felt better. No obscure Southerner, only a colonel of volunteers, should ever make trouble in my family. I knew how the raid would come out. They would all be captured or killed, and if any got away they would come in on foot, leaving their clumsy, sleek horses to the Confederacy. I heard a ticking on my Morse instrument, and my clerk, who had come in, handed me a telegram;

"'AT A CUT LINE, December 10th.

"'GENERAL: I have changed my course. I left out Cumberland Gap. I struck Smithville on the 7th, and captured 100 men. I blew up the works. Wire me at Clinch's. BARTON.'

"By Jove! he is a brick. He will not go through the Gap, and will only get my first dispatch as it follows him, even if they know where to send it. He is going right through Lee County, Virginia, to strike the East Tennessee railroad. Well, I thought it over a few days, and then telegraphed to Clinch's:

"'COLONEL BARTON: *Come back instantly. I dare not risk loss of brigade.*

"'HOBBS, Gen'l Com'd'g.'

"'Ah,' said I, 'always keep on the safe side.' A week rolled away and I got this:

"'BLOUNTSVILLE, VA., 17th inst.

"'GENERAL: Changed my course again. Burned bridge at Chamberstown 720 feet long. It will do up the railway for six months. Wire me at Union.

"'BARTON.'

"By George! he had neither of my dispatches, and I was glad of it. Bridge gone at Chamberstown. The greatest raid in the war. But I am old and wise, and so I will order him to retire into Kentucky and wait further orders. In the meantime Mamie comes into headquarters, and her cheeks are hot and her eyes dance as she says, holding out a copy of the Nashville *Banner* (said Nashville *Banner* was on wheels since leaving Nashville at Buell's advent, and had a large circulation, as it circulated all over the South with its fleeing army. This copy evidently was printed at Knoxville, Tenn).

"'Read it, pa. Your little man is making a big stir. Perhaps if you had sent a six-foot beef-eater he would have bagged the whole Confederacy by this time. Read right here.'

"'LOSS OF ROLLING STOCK—BARTON THE RAIDER.

"'Barton, who espoused the Union cause and went out from us, is now a *hireling Colonel* and is raiding with about two thousand *Yankee scalawags* on our line of communications. Contrary to the usage of war, he yesterday burned another railroad bridge, costing a *half million of dollars*, which cannot be replaced, and crippled all the locomotives he found at stations, or tipped them into the ditch. We understand he has paroled about eight hundred prisoners. *He will grace a limb if captured.*'

"'Mamie,' said I, solemnly, 'he is a brave man.'

"'Oh, pa,' she said, and ran out of the room with the paper in her hand and a sob in her voice. When you think a woman is logical and sound she will knock you silly with such actions as that. I wish I had sent neither of those dispatches, but I wonder where the brave little rascal is. I have not heard from him in a week, only through this Nashville *Banner*. Well, here is a dispatch from General Halleck:

"'WASHINGTON, D. C., December 20th.

"'DEAR GENERAL: Who is this Barton? I get no report from you, but the Southern press gives him credit for being another John Morgan. The President says he can have a captaincy in the regular army if he comes out alive. I have wired GOV.—— of Kentucky to Brevet him Brigadier-General.

"'HALLECK.'

"I begin to have rather an emaciated opinion of my sagacity. I never paid much attention to the collection of autographs, but I would give one thousand dollars apiece for those dispatches, which of course Barton has read by this time, and is without doubt congratulating himself on his narrow escape from being the son-in-law of such an old ass as I am. Yes, and I ordered him back, and he has paroled eight hundred prisoners and done up East Tennessee for all time. Well, he must stand one more dispatch:

"'NASHVILLE, December 21st, '62.

"'BARTON: I congratulate you. Work back through Tennessee. Forrest is intercepting you at Union. Get your men off safely as possible.

"'HOBBS, Gen'l Com'd'g.'

"Hello! here is Mamie. What has she in her hand? A letter, and she says:

"'Can I read you a few lines out of my letter, pa?'

"'Here, let me take it and read the whole letter, Mamie,' and I reached out my hand.

"'I'd rather not. It is from the little man, Barton;' and she blushed.

"'Well, read away, then;' and I felt somehow that my dignity was waning.

"'Just this paragraph, pa,' said Mamie:

"'We struck Forrest on the pike near Galloway's. He had about 3,000 men, and my command had dwindled to 1,500, but I told the men that Western Union cavalry had become a laughing-stock for the world, and I wanted them to stay by me and go in with our sabres. We were going by fours, but where the pike widened out we wheeled into platoons and my old regiment struck Forrest like a cyclone. My black horse is dead, and I caught a clip on the head which spoiled my forage-cap, but we went right through Forrest's men and charged back by company. I send this letter with a detachment bringing in 75 of Forrest's men.'

"'Shall I go on, pa?' asked Mamie.

"'No, that will do,' I said; and I was reminded how the climate was using up my eyes, as they grew misty and I had to get up and go nearer the window.

"Mamie was going to remain until Christmas and then return North. Barton left his command at their old camp and happened to come down to headquarters to report on Christmas Day. How would he receive the old fool of a general who had made a mistake in every dispatch he had sent. I knew where Barton stood in the public estimation, but I would have given two months' pay to know where General Hobbs stood in Barton's estimation. When he came in I noticed that his brown curls had been clipped by the surgeon's scissors, and his white forehead was disfigured, but somehow very interestingly disfigured, by a recent wound. Strange to say, he met me with a pleading smile, as if deprecating any blame. I took heart of grace to say, in a fatherly way:

"'Colonel Barton, I know hardly how to address you. Shall it be as Captain in the Regular Army, or as Brigadier-General of Volunteers?'

"'What do you mean?' asked Barton.

"'I mean that I have a Christmas gift for you, Colonel Barton,' and I reached into a pigeon-hole of my desk and took out General Halleck's letter.

"As he read it a flush came on his pale cheek, and, almost boy as he yet was, a tear gleamed in his eyes. I heard a rustle at the door, and Mamie came in and stood pale and trembling, looking at Barton's wounded brows.

"'Colonel Barton,' said I, 'it is only your due to acknowledge that your successful raid has elevated the *morale* of our cavalry and given confidence to the whole army,'

"'To the whole army, General?' asked Barton.

"'Certainly — ahem — certainly,' I answered.

"'Then I wish I had my share of that confidence,' and he bowed in a courtly manner to Mamie. 'If I had such confidence on this auspicious Christmas Day, I would ask if the State's brevet and the President's commission would make such an addition to the Kentuckian's claim, that he might ask something sweeter, sir, something fairer, sir, than national fame, sir—your daughter's love?'

"'Why—ahem—Colonel,' said I, 'did you not get any of my dispatches?'

"'Never, sir; I moved so rapidly from point to point that I expected no dispatches;' and the colonel smiled.

"Let me attempt to describe the expansion of my whole being when he said that. My uniform seemed to fit me better. My boots creaked again as I rocked back upon them and looked squarely in Colonel Barton's face.

"'My mail,' the Colonel went on, 'has been accumulating for a month and my orderly brought it all to me when I returned. I have it here in my pocket. Ah, here are your dispatches, all having headquarters' stamp and marked '*To Follow*,' and here they are. I will read them now and enjoy your warm congratulations and your plans for my more successful work on the raid.'

"'Hold!' said I. 'Colonel, I am going to give you the Christmas gift you crave; but you are sure you have not read those dispatches?'

"'Why, here they are, General, just as I found them when I returned to camp;' and Barton smiled.

"Then, Colonel, all I ask for my Christmas gift is those unopened dispatches. You will understand how sensitive I would feel to have you now gazing on my warm words of acceptance of you as a son-in-law, and my useless directions as to your raid, when our minds were exactly alike on details. Let me consign my fulsome compliments to the fire unread,' and I reached out my hand and took them. A suspicious look came into Mamie's face as I dropped them in the grate, but she forgot it as I said in a jovial Christmas tone:

"'And now, bless you, my children, bless you;' and Barton folded my romping big girl to his bosom, and Mamie, woman-like, kissed the scar on his forehead, and had a kind of a cuddling, motherly way which seemed very pleasant to Barton.

"General Barton now boasts of the sagacity of his father-in-law who sent him out on that immortal raid, and told him just how to carry it on to success. But I did feel like an old scoundrel when he named his first boy after me, and said at the christening that General Hobbs seemed to love him like a father from the very first interview. Ah, well, the dispatches were securely burned, and it would be a better world if half its written denials and upbraidings might be unopened, delayed dispatches."—A. TEALL WORDEN, *in Frank Leslie's Illustrated Newspaper.*

Alfred Vail and the Electric Telegraph.

TO THE EDITOR OF ELECTRICAL REVIEW:

In reference to the regret expressed that an attack should be made upon Vail's associates in the development of the telegraph by Vail, I have the pleasure to assure you that Alfred Vail never made such attacks, and never, during his life, claimed to have invented the telegraph. It is true that he claimed to have furnished much of the funds, and very largely the mechanical talent necessary or which were used in applying or putting into use the invention of Prof. Morse, which depended largely upon the inventions of Henry and others, and it may well be said that without the invention of batteries, magnets, etc., which preceded Morse's invention, and the assistance of some one better versed in the details of mechanics than Prof. Morse, his labors would not have been crowned with success or his name with honors so great as they have received. But of what inventor may not the same be said?

It is true that Alfred Vail was dissatisfied with the portion of the profits of Morse's invention which he obtained, but this matter was arranged more by Amos Kendall and others who promoted the companies than by Prof. Morse. Vail and Morse were close friends as long as both lived, and although we may not blame Vail, Jr., for getting all he can from the Government, it is a pity he cannot obtain it without endeavoring to dull the lustre of the fame of the man from whom his illustrious father drew all the inspiration which has made him illustrious. Yours truly, HENRY A. REED.

New York, Dec. 21, 1889.

A Youthful Experimenter Startles His Father.

One of the well known citizens of Pawtucket, R. I., and a man of decidedly mechanical turn of mind, withal, says the Providence *Journal*, was severely shocked the other day in the following manner: He has a son, 15 years of age, who is a chip of the old block in his love of mechanics and his desire to see into the reason for everything. The young man is very much interested in, and a firm believer in, the wonderful power of electricity. A few days ago as the father sat down to dinner and attempted to take his knife, the knife refused to be taken up. He glanced at it hurriedly, and saw that it appeared to have been fastened down with a piece of string. Thinking one of his little ones had tied it down for a joke, he administered a mild and playful reprimand, at the same time attempting to take up the fork, at the other side of his plate. But the fork also refused to be taken up. Thinking that his two younger children had combined in the joke, he reprimanded the other little one. In the meantime the young man had been quietly watching the progress of events with a good deal of interest and saying nothing. The father then attempted to take up the knife and fork in each hand, and then he understood the matter, as he received an electric shock that raised him from the chair and set him shaking like a touch of ague. He finally shook the knife and fork from his hands and then proceeded to investigate. He discovered that the innocent-looking young student of electricity had been trying an experiment. Taking a battery which he had made himself in his father's shop, he had concealed it under the table; then, cutting down the bell wire, he had attached it to the battery, and attached one pole to the knife and one to the fork. The result of the experiment was satisfactory to himself, whatever the father might have thought of it.

TELEGRAPHIC

.... The fact has been pointed out that in the organs of the electric fish the electricity is not already formed, but that it is produced at the will of the animal.

.... The electric switchboard being made for the Bureau of Electricity at Pittsburgh, Pa., at a cost of $9,135, will, according to Superintendent Mead, be the most complete electric apparatus of the kind in the country.

.... The Supreme Court of the United States on the 16th inst. rendered a decision in the case of the Western Union Telegraph Company against the Secretary of State of Alabama, and other State officers, brought there on appeal from a decision of the Supreme Court of Alabama. The question involved is the constitutionality of a law of Alabama imposing a tax upon the gross receipts of all telegraph companies for business done within the State. Under this act the telegraph company was taxed not only on business done within the State, but on messages sent to or received from other States. This court, in an opinion by Justice Miller, says that it is hardly worth while to make any discussion about the matter, as the court has six or eight times within as many years decided that messages sent from one State into another are not subject to taxation, because it would be an interference with interstate commerce. Judgment reversed.

"Umgekommen" and "Angekommen."

The English telegraphist who interpreted a gentleman's message to his wife to "come home" into "cog hog" was guilty of an error, remarks *The Telephone*, but it was not nearly so disastrous in its effect as seems to have been the first telegram received by the Emin Relief Committee in Berlin respecting the fate of the brave Pasha. The dispatch stated that Emin had *umgekommen* (died) instead of saying that he had *angekommen* (arrived). The news, of course, caused the utmost dismay, more especially as intelligence had already reached Germany of Dr. Peters's murder. Even the emperor, it is said, was misled by the telegraphist's mistake.

Kansas City's New Electric Club.

At a meeting of telegraph operators and electricians held at the Midland Hotel, Kansas City, recently, preliminary steps were taken toward the formation of an electrical society, the purposes of which will be to discuss subjects pertaining to electricity. Manager W. W. Smith, of the Missouri and Kansas Telephone Company, was chosen president, and other officers were elected as follows: H. C. Sprague, first vice-president; G. W. Bronson, second vice-president; A. W. Barron, secretary, and F. K. Holtzinger, treasurer. Committees on by-laws and constitution were appointed, and the society will soon be permanently organized.

The Club will start out with fully 100 members.

The Difficulties of Matrimony Among Russian Telegraph Girls.

The ladies of the Russian telegraph service are at present raising a great outcry in the press against the hardship of the law in force in Russia since 1864 that they may only marry telegraphists, and only those who are employed at the same station. The official idea is, or seems to be, that they thereby, in case of need, would be able to take the places of their husbands.

In a recent issue of the *Novoe Vremya* there was a pathetically humorous letter on this subject from a young Russian lady. She wrote thus: "I have, therefore, if I do not choose to forfeit my situation, first to fall in love with an electrical swain, then to manage that *he* falls in love with *me;* next to arrange that he is transferred to *my* station. This is," she continues, "a hard task for a poor girl who is riveted 14 hours every day to her apparatus, and does not wish to lose her pittance of 720 roubles a year."

We wonder how this proposition would strike the telegraph and telephone girls of this country!

* * The Van Choate Electric Light Company, with principal office in New York, has filed a certificate of decrease of its capital from five to two millions.

* * The Buckeye Engine Company, of Salem, Ohio, has received orders for a 60 horse-power engine from the Tokio Electric Light Company, of Tokio, Japan, to run an electric light plant.

* * The Electric Light Company, at Great Barrington, Mass., has replaced its engine with a larger one on account of the large increase in its business. It has put on a new alternating current dynamo.

* * The organization known as the Electric Club of Brooklyn, will give a reception at their club rooms in the Johnston Building, Brooklyn, Friday evening, January 31st. An interesting programme is to be rendered followed by dancing. Tickets can be had from any of the members, or by addressing G. Wiedermann, treasurer, 332 Flatbush avenue, Brooklyn. Price of the tickets, 50 cents.

* * The number of electric cars equipped by the Thomson-Houston Electric Company for the West End Company in Boston, Mass., is now about 85. These are all equipped with two motors which, together with the running gear also furnished by the Thomson-Houston Company, cost something over $3,000 for each car. A minimum estimate shows that the Thomson-Houston Company has received or is entitled to receive from the West End Company $255,000 thus far for car equipment alone.

* * At Des Moines, Iowa, the Automatic Railway Signal Company have filed corporate articles with the county recorder. The members of the company are J. A. T. Hull, W. D. Lucas, W. S. Dungan, A.J. Baker, B. B. Taylor, E. J. Fairall, R. M. DeWitt and B. R. Spry. Capital stock, $1,000,000. Mr. D. M. Fike, of this city, is the inventor of this useful device. Mr. Fike has also invented and applied for a patent on an electrical apparatus to prevent head-end collisions between railroad trains. Practical railway men are confident of the success of both these inventions.

The Decatur, Ill., Electric Railway.

The Citizens' Electric Street Railway, Decatur, Ill., changed from horse-power to electric motors, August 27, 1889, and has since been in successful operation. The road is five miles in length of which 2,500 feet is double track. On the double track 40 lb. T-rail is used, and on one mile of single track the Wharton girder rail, the remainder being laid with 25 and 30 lb. T-rail.

The overhead system has been used throughout, the main conductors being suspended from cross wires from poles placed on each side of the street at a distance of 125 feet apart. The maximum gradient of the road is five per cent., with several ranging from this to three per cent.

The cars are eight in number, and are each equipped with one 15 h. p. Thomson-Houston motor. They are in operation 18 hours a day, and make on an average about 105 miles each.

The power station is a one story brick building 40x80 feet and contains two 125 h. p. engines, two 80 h. p. generators and switchboard with necessary fittings. The boiler room is 30x40 feet, and contains two 100 h. p. boilers.

The car house is a two story frame building 50x120 feet, having five tracks, two of which have pits extending their entire length. These pits are 3½ feet deep and have brick sides and cement floors, and are used for oiling and cleaning the motors.

Since electricity has been adopted the travel has increased 100 per cent.

"Electricity in the Household."

The issue for January of *Scribner's Magazine* is particularly entertaining and valuable. The article which will interest electrical people, and which is written in popular text, is entitled "Electricity in the Household," the author being Mr. A. E. Kennelly, the very capable chief assistant of Mr. Edison at his laboratory.

The author treats of electric calls, regulation of temperature, thermo static fire alarm and electric door openers in the first part of his article. That is followed with description of the use of the electric clock, electric time protector, telephone, incandescent lamp, electric fan, phonograph, electric heating, etc. A very pretty illustration of a conservatory lighted with incandescent lamps is presented, also one in which an electric fan is exerting its cooling influence on the desk of a writer.

In speaking of electric heating and electric cooking, the author has the following to say:

"Public attention has latterly been drawn to the question of electric heating supply to houses, and it has been frequently supposed that the apparent novelty of the plan favored its commercial success. The fact is, however, that of all the practical applications of electricity, there are none whose limits and possibilities are more clearly defined and better understood than heat distribution, for the simple reason that it has been attentively studied for the last 10 years. This is apparent from the fact that the problem and task of electric lighting is, primarily and essentially, electric heating. Almost all the energy supplied electrically for the purposes of illumination is dispensed in the form of heat, and this heat is expended with the maximum economy that the engineering of the day permits in maintaining our carbon filaments at incandescent temperature. Despite the high economy in the consumption of power that the electric lamp possesses in comparison with combustible sources of illumination, it has lately been shown, by experiments at Cornell University, that only some five per cent. of this heat is yielded in rays of light, the remainder (at present essential to securing this result) being spent in raising the temperature of the air and surrounding objects. Consequently, whatever improvements the art of electric lighting may effect in economizing this large heat expenditure and raising it into visible radiance, science appears to have determined that a given supply of electrical power can only yield the same amount of heat that it now develops in passing through our lamps. One form of electric heater operating within narrow limits might bring a piece of metal to melting-point, while another only slightly raised the temperature of a large volume of water; still the total quantity of heat developed in each for a given supply of electrical energy would be precisely the same. The only economy that can be looked for in the distribution of heat lies, therefore, in saving the waste incurred by forcing electricity through the mains, and this is a margin that modern engineering has already rendered comparatively narrow.

"Heat being already distributed electrically on a large scale to houses for the operation of incandescent lamps, can be and already has been applied for heating purposes exclusively. The difficulty of carrying out this plan on a large scale, in order to replace household stoves and furnaces, is a purely economical one. The question ultimately reached is, whether labor can be saved to a community if all the coal necessary for their heat supply through the medium of electricity be burned in one central station, and the electrical power so obtained distributed generally, instead of continuing the usual custom of burning the coal in each house locally. On the one hand, the local process of combustion is at present a wasteful as well as a dirty one, most of the heat escaping by the chimneys; while, on the other hand, the steam engine is necessary in the central station to convert the furnace heat into electricity, and the best modern engines are only capable of utilizing 10 per cent. of the heat developed from the combustion of coal under their boilers; so that, when the machinery and conducting system of mains are taken into account, the verdict (notwithstanding household smoke and waste) has been hitherto against the economic possibility of the electrical distribution of heat on a large scale. But every improvement effected in the machinery for the conversion of furnace heat into electricity, every advance made in the progress of electrical engineering, modifies in proportion the balance of advantages in this great social problem, and it is well within the reach of possibility that electric heating may be as successful at some future date as electric lighting itself. Even now there are many occasions where heat is required to be applied very locally, in culinary purposes, for instance, and where the cleanliness and convenience of the electrical method might outweigh the objection of slight extra expense. The advantage to a man whose duties call him out during the night, of being able, from his bedroom, to set an electric coffee heater at work in his dining room, so that by the time he is ready to leave the house he finds hot coffee awaiting him and all without arousing any person in the house, far outweighs the three or four cents for electrical power that the beverage has probably cost him. Similarly, there are times when a foot warmer is worth many times over the expense of electrically preparing it at a few minutes' notice.

"Both of these commodities are in actual use. The stove is an ornamental case enclosing a coffee-pot, or, in another form, it may be a kettle in an asbestos lining, round which circulate coils of wire, the passage of the electric current through these coils generating the heat. In one convenient form the current that would feed 15 ordinary incandescent lamps will produce hot coffee in ten minutes."

An Electro-Technical Exhibition for Frankfort.

A notice in circular form has been received, dated Frankfort, Germany, November 20th, 1889, announcing the projection of an electro-technical exhibition to be held at that place next year.

This international exhibition will include all branches of the electrical science and industry, and, it is expected, will be far superior to those special exhibitions held at Munich and Vienna.

It is proposed to divide the exhibits into 12 distinct groups, as follows:

1. Motors for electro-technical purposes, such as steam, water, air, gas engines, etc., steam generators, etc., accessory apparatus.
2. Generators of electricity.
3. All kinds of apparatus for conducting and distributing the electric current. Accessory apparatus, etc.
4. Accumulators, transformators, etc.
5. Devices for transmission of electric energy and its employment for industrial purposes, etc.
6. Electric light and a special section for fittings of all kinds.
7. Telegraphy, telephony, safeguards against lightning, fire, theft and other dangers. Telegraphic fittings for houses, hotels, etc.
8. Electrical appliances and apparatus for railways, tramways, ships and nautical science.
9. Electrolysis, electro-metallurgy.
10. Electric apparatus for scientific, measuring, optical, acoustical and school purposes, etc.
11. Electro-therapeutics, electro-surgery.
12. Electrical literature, etc.

The exhibition will open on the first day of June, and remain open until November 1st, 1890.

Testing an Electric Light Plant.

A recent test was made by Chas. S. Pardoe of the plant of the Schuyler system at Alexandria, Va. We publish the test as ported by Mr. Pardoe, as it will interest many of our readers to see how it was done:

Instruments used were Ayrton & Perrry ammeter; Western Electric galvanometer (200 ohms coil); high resistance voltmeter; Wheatstone brridge, and 24 cells standard "Barrett" battery.

The weather was cloudy, and rain began to fall about one hour before the tests were made of the line. A joint in the line wire in the station was found not soldered and was ordered to be made good.

It would be advisable, though not in the contract, to have guards put on all poles where the line turns a corner. The insulation of the line was found to be over 5 megohms.

The resistance of the smaller circuit was 7.2 ohms, showing a line of about five miles, more or less. The resistance of the larger circuit 9.8 ohms, showing a line of about 6½ miles, more or less. A special test of the conductivity of the wire used was made on Monday, November 18th, and showed a percentage of 98.1 pure copper.

Tests of the machines were then made. Both machines were run with three and only three lamps in circuit.

Reading taken from the voltmeter and ammeter at that time gave the voltage per lamp as 45, and amperes per lamp as 7.

Resistance of lamp (hot)..... 6 42 ohms.
Watts per lamp.....315.
Energy per second..... ..... 32.104 kilogrameters
Elect. horse-power per lamp .42.
Number of lamps per h. p.t.. 2.

Each dynamo was then run for 1½ hours on a circuit of 11 to 12 miles with a full load of 50 lamps. Amperes during this time were 7. The fields of the machines and also the armatures were hardly warm after the above run, the regulators working to a nicety even on a "dead short circuit" of the line.

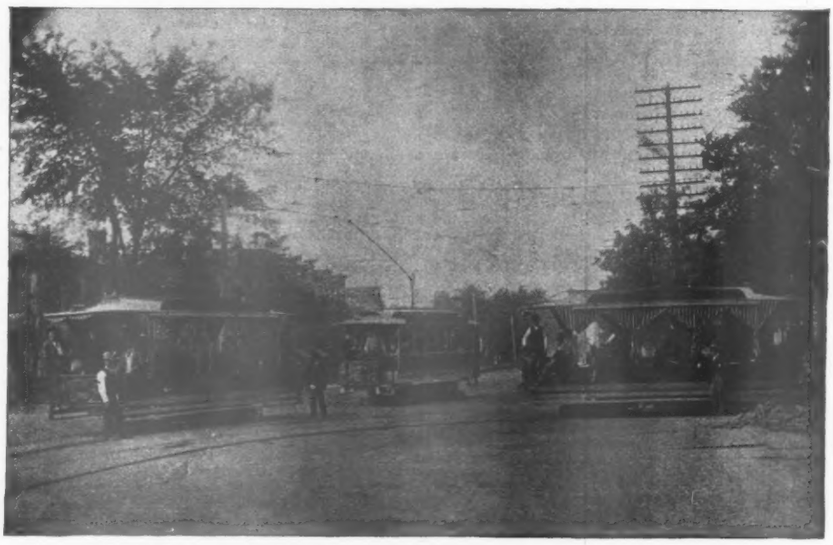
I have read the specifications and have carefully examined the line construction and the station work, and have to say this:

I. The construction of the pole line is first-class in very respect and the insulation of the line very high.

II. The station work is thorough and in accordance with the rules of the Board of Fire Underwriters.

III. The two machines are able to carry their full load of 50 lights on 10 miles of circuit without heating or reduction of the candle power of lamps.

In conclusion, I find that the contract has been lived up to by the Schuyler Electric Company in every particular, and consider the plant in a fit and proper conditon to be received by the proper persons.



THE ELECTRIC RAILWAY AT DECATUR, ILL.

ELECTRICAL WORK IN THE NAVY.

ABSTRACT OF THE ANNUAL REPORT OF COMMANDER BRADFORD, INSPECTOR OF ELECTRIC APPLIANCES, UNITED STATES NAVY.

Commander R. B. Bradford, of the United States Navy, Naval Inspector of Electric Lighting, has submitted to the Chief of the Bureau of Navigation his annual report. The REVIEW presents an abstract of this report, which covers the work performed under the supervision of the commander.

SHIPS INSTALLED WITH ELECTRIC LIGHTING PLANTS.

"TRENTON."—The plant of this ship continued to give satisfaction and performed excellent service up to the date of her loss on March 16, 1889.

When the ship was wrecked at Samoa, the dynamo was run until the fires were put out by the seas which came on board, and was in good condition to the last.

The insulated wire used in the installation of this ship, though of the best pattern, was without lead covering. The mains of the ship all concentrated about the mainmast, and at this point entered the dynamo room. Although they were run in copper tubing, they were almost constantly wet, and in time the insulation absorbed sufficient water to produce very apparent leaks. This result points to the necessity of the mechanical protection of the insulating material afforded by the lead covering.

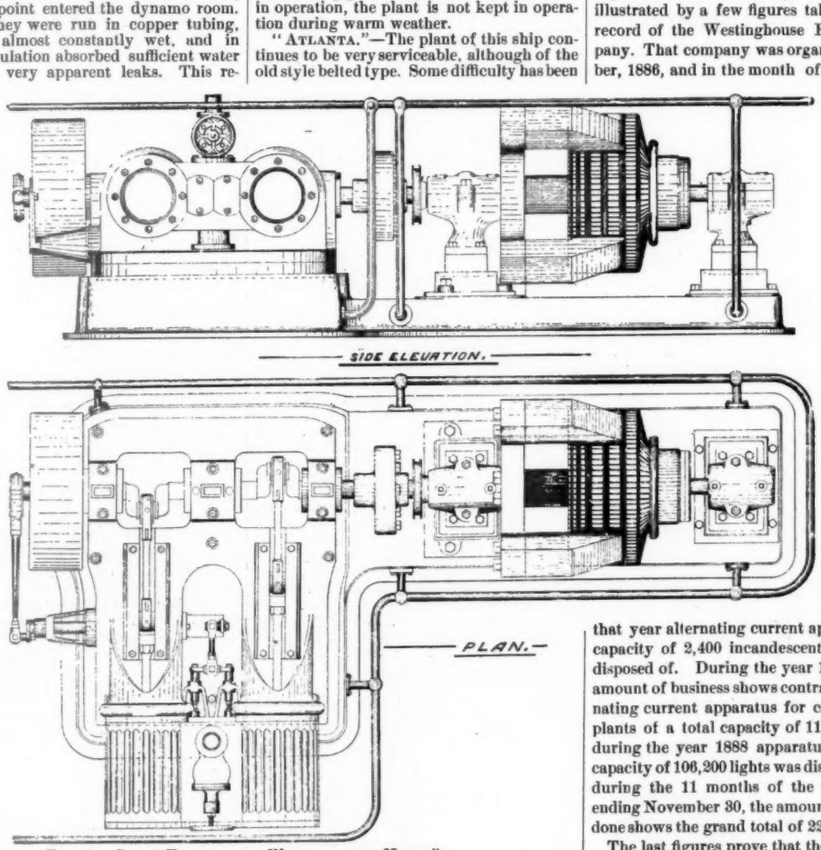


FIG. 1.—SEE "ELECTRICAL WORK IN THE NAVY."

"OMAHA."—The new plant installed on board of this ship has continued to give satisfaction. The wiring of the ship has been completely renovated, and many improvements made in the location of lamps, fixtures, etc., by Lieut. J. B. Murdock, U. S. Navy. All work of this kind has been performed by the seamen gunners on board, the necessary materials having been forwarded from the United States. The arc light supplied has been frequently used with great satisfaction for coaling ship at night. The lamps of the Sawyer-Man pattern in use on board in many instances have shown a remarkably long life, several having a record of from 5,000 to 7,000 hours each. The necessity for the use of a separator has been made very apparent, water having frequently flooded the cylinder of the dynamo engine, particularly when the ship has been anchored in the rivers of China, where the water is very muddy.

Lieut. Murdock has conducted some very interesting experiments in reference to the use of signals by means of electric lamps. The regulation red and green signal lanterns were fitted with 16 candle-power lamps, and the necessary apparatus for opening and closing their circuits. The current was kept on from two to five seconds, and the various combinations necessary to represent different figures were easily read by an officer stationed three-fourths of a mile distant. It was estimated that with a proper separation of these lamps these combinations could be read at a distance of two miles. It was thought on board that if 32 candle-power lamps were used, these combinations could be read at a distance of from four to five miles. A message requiring the use of 12 stars of the Very system was made in 30 seconds.

The great benefit of electric lights on board of the "Omaha," particularly when in the very warm and humid climate of the Asiatic station, is much appreciated and frequently testified to by the officers and men of the ship.

"NEW HAMPSHIRE."—The plant of this ship, located on shore at the United States naval training station, is reported to be somewhat out of order. From the quarterly reports it is evident that the entire plant should be renovated and put in thorough condition. It is probable that when this is done it will be advisable to arrange a small central station for supplying light, not only to this ship, but to all buildings of the training station located on Goat Island, also the necessary street lamps.

"DOLPHIN."—The plant of this ship is badly located, being on the berth deck. On account of the heat radiated from the engines and steam pipes, and the noise caused while in operation, the plant is not kept in operation during warm weather.

"ATLANTA."—The plant of this ship continues to be very serviceable, although of the old style belted type. Some difficulty has been experienced when at sea, with a list on the ship, in keeping belts on when the latter are much worn and greasy. No serious difficulty of this kind has been encountered, however. Some faults have occasionally occurred in the insulation of the conductors, but nothing to prevent the running of the plant. When in port it has frequently been run continuously for a period of one week. During the past year a number of Sawyer-Man lamps have been supplied to this ship for use, and although the expenditure is still larger than in its sister ship, the "Boston," the average lifetime is good, both of the Sawyer-Man and Weston type.

"BOSTON."—The plant of this ship has continued during the past year to be largely experimental. The second plant installed, briefly referred to in last year's report, was completed Sept. 29th, 1888.

"CHICAGO."—The installation of this ship was completed in May, 1888. It is briefly described in the report from this office for that year. Since its completion it has operated constantly with satisfaction in every respect until very recently. The insulation of the armature of one machine, also the insulation of one of the field coils of the other machines, became so much impared that there was danger in operating the dynamo, and necessitated rewinding both. These repairs have been effected at moderate cost and the plant is now in good order. They were probably caused by the fact that the engines are located on a framework immediately above the dynamos, and it is

(Continued on page 10.)

A Convenient Tool for Linemen.

This tool is intended for removing the insulating material at the extremities of insulated wires, and is manufactured in Munich. Its jaws are kept open by a spring; one of them carries a steel blade perpendicular to the axis of rotation of the jaws; the other jaw is provided with a concave circular notch opposite the steel blade. The wire is inserted in this notch, and the instrument is turned so as to cut the insulating layer, which is subsequently removed by means of the jaws. The blade serves for laying the wire bare so as to obtain a good contact.

Electric Lighting Done by the Westinghouse Company.

The wonderful growth of the electric lighting business in this country is very strikingly illustrated by a few figures taken from the record of the Westinghouse Electric Company. That company was organized November, 1886, and in the month of December of that year alternating current apparatus for a capacity of 2,400 incandescent lamps were disposed of. During the year 1887 the total amount of business shows contracts for alternating current apparatus for central station plants of a total capacity of 119,950 lights; during the year 1888 apparatus for a total capacity of 106,200 lights was disposed of, but during the 11 months of the present year, ending November 30, the amount of business done shows the grand total of 223,600 lamps.

The last figures prove that the business of this year bids fair to exceed the combined amount of business accomplished during all previous years since the company was organized.

The REVIEW is pleased to place these interesting figures before its readers, and hopes to be able to publish others showing the great growth of electric lighting generally.

—— Mr George W. Silsby, of the United Edison Manufacturing Company, has recently made the following sales: The Antiedum Paper Mills, Hagerstown, Md., an isolated plant; Beverly, N. Y., central station, 700 sixteen candle-power incandescent lamps; Martinsburg, W. Va., 25 Edison-Sperry arc lamps and 100 thirty-two candle-power municipal, also 1,000 sixteen candle-power commercial.

—— The Thomson-Houston Electric Light and Power Company are giving exhibitions of their light, both arc and incandescent, to the delight of the natives of Kingston, Jamaica. The light seems to attract the black population *en masse*, and only want of wings prevents them from flying to the light like bugs and birds. The above company have good prospects of getting contract to light Kingston, a city of 45,000 inhabitants, as their light has the unanimous praise of the people there.

ELECTRIC LIGHT NEWS

—— In Franklin's time electricity was a wonder. Now the people make light of it.

—— Charleston, S. C., will be lighted by electricity before January 1st, in accordance with contract.

—— Columbia, S. C., will soon be illuminated by electricity, work being nearly completed at that place.

—— An electric spark has been photographed by means of a special camera, in which the sensitive plate rotated at, it is said, a velocity of 2,500 revolutions per minute.

—— Electric lights are now being placed at North Adams, Mass., and the streets will soon be lighted by electricity till midnight, from then till morning by gas.

—— The electric light company at Greenbush, N. Y., are rapidly stringing their wires through the village. Mr. Sabbatin, president of the company, is confident that the light will arrive with the New Year.

—— Judge Gideon Wells, of Springfield, Mass., will succeed John B. Stebbens as president of the Holyoke (Mass.) Water Power Company. The company will erect a $100,000 electric light plant next year.

—— The new Marty Building, Kansas City, Mo., is to be lighted by electricity. Messrs. English, Morse & Co., of that city, contracted for the power, which consists of one 70 horse-power Ide engine with American link belting.

—— The alternating current system of the Westinghouse Electric Company is very extensively adopted in Texas, the company now operating 15 central station plants in that State. The last contract was closed a few days ago with a corporation in McKinney for apparatus for a central station plant of 500 sixteen candle-power incandescent lamps.

—— The Uniontown, Penna., Light and Heat Company is chartered at Harrisburg. The directors are J. K. Ewing, J. K. Ewing, Jr., L. L. Minor, S. E. Ewing and J. J. Allebaugh. This is the company by whom the illuminating gas plant is to be operated. The capital stock is $25,000, equally divided between the five directors, and it will not be offered for sale.

—— At the annual meeting of the Winchendon (Mass.) Electric Light and Power Company, held on the 12th inst., the following board of directors were chosen: M. E. Converse, F. W. Russell, S. A. Greenwood, Amos Lamb, G. N. Goodspeed, J. N. Richardson, W. A. Carey, F. M. Collester, W. C. Corey. The directors have elected Morton E. Converse president, and W. C. Corey treasurer and clerk.

—— Supt. J. E. Powell has made the following report and recommendations, which have been approved by the Secretary of the Treasury: "It should be stated that the qualifications of persons to fill the position of chief engineer of the public buildings containing large electric lighting plants should be carefully inquired into, particularly in regard to their knowledge of electric lighting. The ordinary examination required from United States Local Inspectors of Steam Vessels, while it may protect the Department from employing men incompetent as engineers, does not and cannot protect it from incompetent electricians and secure it the service of men skilled both as engineers and practiced in the management of electric lighting plants. I recommend that applicants for the positions of chief engineer and assistant engineer in public buildings, having electric lighting plants owned by this department, be required to present satisfactory evidence of their ability to operate electric lighting plants in addition to the requirements ordinarily exacted of the engineers."

KINDRED INTERESTS

The Parker-Russell Mining and Manufacturing Company, St. Louis, have removed their offices to the Mermod-Jaccard building, corner Broadway and Locust street. This company is widely known as the manufacturer of the "Sun-Light" carbons for electric lighting.

The Van Gestel Electric Street Car Company of New York.—This company will soon place before the public the Van Gestel system of electric traction. The peculiarity of the new system lies in the fact of the dummy being an independent car, carrying the storage batteries and driver, and drawing two passenger coaches, it is claimed, at a rate of 10 miles per hour.

The Electric Construction and Supply Company, 18 Cortlandt street, is very busy at the present time putting in the Kinsman arc lamp. This lamp is designed expressly for use on incandescent circuits and its introduction proved a popular move. The company has just contracted to light the *Sun* building throughout, and have put in a 650 light machine which will run 20 arc lights, as well as a number of additional incandescent lights. A number of downtown business houses are using this arc lamp in connection with their incandescent systems.

The National Pipe-Bending Co. of New Haven, Ct., manufacturers of the National feed water heater, report the sale of over 100 National feed water heaters during the months of October and November, a large number of which were for electric plants, including 100 h. p. to Brockport Electric Co., Brockport, N. Y.; 500 h. p. to Newton Gas Light Co., Newton, Mass.; 125 h. p. to Salem, O.; 200 h. p. to Bridgeton, N. J.; 100 h. p. for electric company at Morristown, N. J.; 80 h. p. for company at Hontzale, Pa.; 1,000 h. p. to electric company at Kingston, Ont.; 150. h. p. to Citizens' Electric Co., at Shenandoah, Pa.; 500 h. p. to El Paso Electric Co., Colorado Springs, Colo.; 500 h. p. to Paterson Electric Co., Paterson, N. J.; 200 h. p. to Edison Electric Illuminating Co., Easton, Pa.; 500 h. p. to New Bedford, Mass.; 800 h. p. to East River Electric Co., New York, N. Y.; 100 h. p. to Albion Co., Albion, N. Y.; 200 h. p. to Thomson-Houston Co., Nagasaki, Japan; 500 h. p. to No. Attleboro Electric Co., Attleboro, Mass.; 150 h. p. to Calgara, Alberta, Canada. They have orders on their books now for December delivery for three 100 h. p., two 150 h. p., three 200 h. p., one 600 h. p. and one 1,000 h. p.

Shultz's Patent Leather Covered Pulleys.

Heretofore, in covering pulleys with leather, it has been customary to drill holes in the face at each edge of the pulley and rivet the leather on. The Shultz patent covering being wider than the pulley face, its edges are brought over the edges of the rim and then turned towards each other and fastened on to malleable iron segment clamps, with teeth to hold the leather; the clamps are placed around the pulley under the rim, and drawn together by a quarter-inch bolt, which draws the leather tight over the face and edges of the pulley. In this way, the leather can be drawn on the face of the pulley as tight as a drum-head, as the process of drawing is in a degree similar, and should the covering ever become loose, it can be tightened in a few minutes, simply with a screw driver to turn the bolts.

The process of covering a pulley is a very simple matter. All that is needed is a leather covering, long enough to go around the pulley and make a lap joint, and two inches wider than the face of the pulley, an inch being turned under on each side. Cement the lap, as in a belt joint, bring the edges under the rim of the pulley, fasten to the segment clamps, put bolt through clamps, and draw until the covering is as tight as desired; then the work is done, and it will last a life time.

The pulley being so perfectly covered, the belt will wear much longer; besides, a leather covered pulley, says Mr. Shultz, will drive 50 per cent. more than an iron faced pulley; belts can also be run slacker, preventing heated journals and wear and tear on machinery. We illustrate such a pulley on this page.

ELECTRICAL WORK IN THE NAVY.

(*Continued from page 9.*)

considered probable that moisture from the engines and their attachments was the cause of the difficulty in the insulation. No trouble is anticipated in the future unless it is from the cause already alluded to, which it is thought may with care be avoided.

The engines of this plant, although of the commercial belted type, perform in a very satisfactory manner, and will run the dynamos with full load, atmospheric exhaust, with 40 pounds of steam.

"YORKTOWN."—The installation of this ship was briefly described in my report of last year; since then it has been completed. The general character of the plant, consisting of two units in every way the same, is shown in Fig. 1. It consists of two engines and two dynamos, each being a counterpart of the other, thus permitting the interchange of spare parts. The dynamos are of the Edison type, compound wound and multipolar, making 400 revolutions per minute, and of 80 volts and 100 amperes. They have a commercial efficiency of 83 per cent. They also have 4.32 watts output per pound of metal not including the bed-plate, and 3.64 watts out-put per pound of metal including bed-plate. No part of their circuit heats over 40° Fahr. above the temperature of the surrounding air after being run for four hours with a full load.

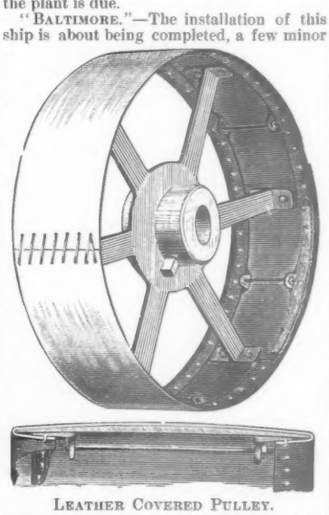
They are directly connected to the engine by means of a Brotherhood flexible coupling. The engines are Armington & Sims horizontal, double-acting, with two cylinders, each 7 by 5 inches and weighing 2,230 pounds. They will drive the dynamo at full load with steam pressure of 60 pounds, atmospheric exhaust, cutting off at one-fourth; by following further they can be used at considerably low pressure. The extreme variation in speed of these engines, when going suddenly from no load to full load, is about six revolutions.

The total number of lamps installed on board is 234; of these 134 are of 10 candle-power, 86 of 16 candle-power, 14 of 32 candle-power.

Many improvements were introduced in the installation of this ship over that of the "Chicago," and it is the first one to have a plant with the engine and dynamo directly connected. The switchboard is of slate, and all junction-boxes and most of the fixtures and switches are water-tight. It is thought that the accidents arising from the presence of water on conducting metal or from fire are reduced to a minimum in this ship. The vessel was commissioned in February last, since which time a dynamo has been almost constantly in operation. The character of the installation has given great satisfaction to those on board. The dynamo room, which is located below the armored deck, is ventilated by means of a Blackman fan driven by an electric motor. The ventilation is reported to be excellent.

The inspector of the installation, located at the works of the builders, was Lieut. T. E. DeWitt Veeder, U. S. Navy, to whose thorough interest in the work the success of the plant is due.

"BALTIMORE."—The installation of this ship is about being completed, a few minor



LEATHER COVERED PULLEY.

details only requiring to be finished. The lights have already been used during her trial trips and at other times when necessary, and promise great efficiency. The plant, the general character of which is shown in Plate 1 (see Fig. 1), consists of three units, identical in every respect. Each unit is made up of one Edison compound-wound multipolar dynamo, of 80 volts and 200 amperes, connected by means of a Brotherhood flexible coupling to an Armington & Sims horizontal, double-acting engine, with two cylinders, each 7 by 5 inches. The dynamos make 400 revolutions per minute, and have a commercial efficiency of 86 per cent. watts out-put per pound of metal, including dynamo bed-plate, 4.17; watts out-put per pound of metal, not including dynamo bed-plate, 4.75; no part of the circuit of either dynamo heated more than 36° Fahr. above the temperature of the testing-room after a trial of four hours with full load. The insulation of all parts is over one megohm. The engines will drive the dynamos at full load with a steam pressure of 80 pounds, atmospheric exhaust, one-fourth cut off. They govern very closely, generally within 1 per cent. during any ordinary charge of load.

The details of the installation are very similar to those of the "Yorktown," a few improvements suggested by experience having been made. The number of lights installed is 451, consisting of 262 of 10 candle-power, 176 of 16 candle-power, 8 of 32 candle-power, and 5 of 50 candle-power.

Some of the fixtures are much improved over those of the "Yorktown." Work of installing the ship has also been under the supervision of Lieut. Veeder, U. S. Navy, as resident inspector, and to his efficient aid the excellence of the plant is due.

"CHARLESTON."—The electric lighting plant of this ship, with the exception of a few minor details, has been completed. It consists of three dynamos of the same pattern as those used on board the "Baltimore." Two of these dynamos are directly connected by means of flexible couplings to two vertical compound engines of the Allan type, constructed at the Union Iron Works, San Francisco, Cal. The third dynamo is connected to an engine similar to those used on board the "Baltimore," and is shown in Plate 1 (Fig. 1). This became necessary on account of the decreased vertical space in the dynamo room, caused by the slope of the armored deck, and will afford a good opportunity to test the relative merits of the two types of engines for running dynamos.

Specifications and requirements of the installation of the "Baltimore" served as a guide for that of the "Charleston," and most of the fittings are precisely similar. The tests thus far of the installation of the "Charleston" have been very successful, and during her recent speed trial it was declared that it would have been impossible to have run at such a high rate of speed without electric lights in the engine and fire rooms. The total number of lamps installed is 440, consisting of 168 of 10 candle-power, 251 of 16 candle-power, 21 of 32 candle-power. The installation of the ship, at the Union Iron Works, San Francisco, Cal., has been under the direction of Lieut. A. W Grant, U. S. Navy, who has shown great zeal, intelligence and skill in prosecuting the work.

"PENSACOLA."—The installation of this ship has been completed, though subject to many delays on account of repairs on the ship having been interrupted. A single plant only has been placed on board, and this is in every respect similar to one of the units installed in the "Baltimore," and shown in Plate 1 (Fig. 1). With the exception of some defective insulation, the plant is now all ready for service. The total number of lamps installed is 270, consisting 148 of 10 candle-power, 121 of 16 candle-power, and one of 32 candle-power. The installation has been completed under the local supervision of Lieut. Lucian Flynn, United States Navy. Many difficulties were encountered by him, on account of the ship having been sunk in the dry dock while the installation was partially finished, doing much damage to various parts. Among the difficulties was one of considerable interest, namely, the fact that the porcelain blocks used in the junction boxes absorbed so much salt water that after the water was evaporated the deposit of salt remaining was the cause of very inferior insulation. This was eventually overcome by boiling the porcelain blocks in fresh water and afterwards in paraffine.

"PHILADELPHIA."—The builders of this ship, Messrs. William Cramp & Sons, Philadelphia, Pa., have sublet the installation of electric lights to the United Edison Manufacturing Company, 65 Fifth avenue, New York. The fixtures will be supplied by Messrs. Williams, Page & Company, 24 Beach street, Boston, Mass. The work has already been commenced. The installation will practically be similar to that of the "Baltimore," with some few modifications and improvements suggested by experience.

"SAN FRANCISCO."—This ship will have an installation consisting of three Edison compound-wound, multipolar dynamos of 80 volts and 200 amperes each, driven by Allan compound vertical engines.

"CONCORD" AND "BENNINGTON."—These two ships are practically the same as the "Yorktown," and are being constructed by Messrs. N. F. Palmer, Jr., & Company, at Chester, Pa. The builders have sublet the electric installation to the United Edison Manufacturing Company. Two dynamos and engines, similar to those supplied to the "Yorktown," will be furnished to each ship. The general character of the entire installation will be similar to that of the "Yorktown," with perhaps some minor improvements suggested by experience on board of the latter vessel since she has been commissioned.

"PETREL."—It was not originally intended to place electric lights on board this vessel. The expediency of lighting small ships by electricity was discussed in my report for 1887. As an appropriation was made last Congress for installing this vessel, a contract has been entered into between the department and the Thomson-Houston Electric Co., of Boston, Mass., for that purpose. The vessel will be supplied with two units, each consisting of a dynamo of 80 volts and 50 amperes, making 500 revolutions per minute, directly connected to an Armington & Sims vertical simple engine, with two cylinders, each five by three inches. The general character of this plant is shown in Plate 3 (Fig. 2). It is expected that one unit will be ample for supplying incandescent lights, and the remaining unit will supply current for one powerful search light. The weight of the engines, dynamos and bed-plates complete is limited to 6,000 pounds. It is confidently anticipated that a superior plant will be installed.

"VESUVIUS."—An appropriation also having been made for installing the "Vesuvius" with electric light, a contract was entered into with the Thomson-Houston Company. Her plant will be a single unit, similar to the units of the "Petrel." If found necessary, a smaller plant may be installed later for working search lights alone.

"VERMONT."—Six thousand dollars was appropriated for the installation of electric lights on board of the receiving ship "Vermont." Some delay has been occasioned in commencing the work, on account of changes in the location of the boiler house, etc. It is proposed to locate the dynamo and engine on the cob-dock. Both will be of the ordinary commercial pattern and connected by means of a belt. It is proposed to install a dynamo with a capacity of about 300 sixteen candle-power lamps.

"MIANTONOMOH."—This ship is now in a condition to receive her electric lighting plant, and specifications have been issued. It is proposed to install on board two dynamos, both of 80 volts, one of 400 amperes and the other of 200, each driven by a separate engine. It is thought that these will furnish sufficient current for incandescent and search lights, and also for any power motors that may be required.

ELECTRIC CONDUCTORS IN SHIPS.

All electric conductors on shipboard are now subject to the supervision and direction of the Bureau of Equipment and Recruiting, and directly under the control of this office as a part of that Bureau. All wires will now be run on board ship under the supervision of the same officer, and will be kept separate and distinct, each being arranged so as to permit of the greatest efficiency.

SEARCH-LIGHTS.

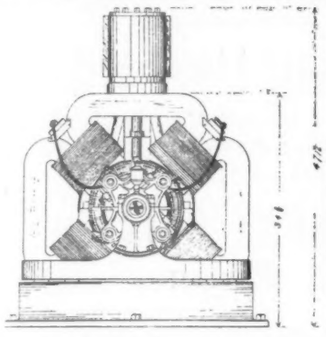
A search-light outfit for most of the new ships has been contracted for. They are to be supplied by the Thomson-Houston Electric Company, of Boston, Mass. Two projectors are being installed on board the "Yorktown." Those for the other cruisers which are about completed, such as the "Baltimore" and "Charleston," have not yet been received. It is proposed hereafter to install search-lights at the same time that other electrical appliances are installed. They will then be ready for trial when the ship is finally accepted. Not a single ship has been installed with search-lights during the past year. It is the opinion of naval experts generally that search-lights are very important for use on board ships of any considerable size, and no vessel of war is now complete without them, ranging in number for any one ship from one to twelve. The senior officers of the Italian navy are so impressed with the importance of locating the search-lights well down near the surface of the water that their largest and most important ships are provided with a double tier of projectors. Those on the lower tier are operated through water-tight doors, and are so low that they can not be used in a sea way, being then withdrawn and the doors closed. It is sometimes difficult to find a place for the projectors where they will be clear of the fire from the main secondary batteries. For this reason the tendency has been to elevate them and place them on top of pilot houses, in tops and other high localities. I regard this as very unwise, and consider that ports should be provided for them under the forecastle and in after-cabins in ships provided with forecastle and poop-decks. Under any circumstances provisions should be made for their location in designing a ship, rather than to pursue a policy of finding a place after the ship has been finished.

It has been the custom recently to install search-lights of minor power on board torpedo boats, and even sometims in ships' launches. Recent experience with torpedo-boats among the Continental powers indicates that these lights can not be used to any advantage; the boats are so lively in their movements that it is impossible to keep the rays of the search-light on any one point, and the general result is that they simply advertise the locality of the boat itself. Small plants for incandescent lights, however, are very important in rendering torpedo-boats habitable.

ELECTRIC LIGHTING INSTALLATIONS AT NAVY YARDS AND NAVAL STATIONS.

Sixty thousand dollars was appropriated by the last Congress to inaugurate a system of electric lighting at the navy yards at New York; Norfolk, Va.; Washington, D. C.; and Mare Island, Cal. A contract has been made with the Brush Electric Company, of Cleveland, Ohio, for the installation of two engines and four dynamos, also 97 arc lamps, with all the necessary appurtenances and fittings of a central station at the Washington Navy Yard. It is proposed, when the entire system is complete, to have a plant capable of operating one hundred and eighty 2,000 candle-power arc lamps, and one thousand two hundred 16 candle-power incandescent lamps. Twenty-two of the present installation of arc lamps are intended for outside lighting, and 75 for lighting the interior of the ordance shops.

Specifications have been prepared for the inauguration of a central station at the navy-yard, New York. It is proposed to begin here also with arc lights, their presence for police purposes being considered the most important. It is designed to have at the New York central station, when completed,



a plant with a capacity for two hundred and forty 2,000 candle-power arc lamps, and two thousand four hundred 16 candle-power incandescent lamps. Active steps will be taken at once to make a contract for the first installment of the necessary plant.

The remaining navy yards at Norfolk, Va., and Mare Island, Cal., have been studied with a view of locating the necessary lights, and as soon as it is determined where to locate the the central station and the building prepared, the specifications will be ready for issue. The lighting plant in all instances at navy yards will be capable of being used as a power plant during the day time when power in detached places is desired. A small dynamo has been installed in the New York Navy Yard already, which is used for the purpose of running drills and other small power tools, and the use of electricity for such purposes promises to be very successful. It is not economical for large motors which can be conveniently run by steam; but for small motors, which are located at distant points from the steam supply, electricity is not only economical but a very useful agent. When the central station at the New York Navy Yard is complete, it will not only afford a very much improved system of lighting, both economical and very efficient, but it will enable night work to be performed on occasions of any emergency, and greatly to the efficiency of the police of the yard, and enable work to be performed in the interior part of the new ships by furnishing both light and power much better than can be performed in any other possible manner. I beg to call attention to this most important subject, and to express the opinion that it will aid the work of building up a new navy very much, if appropriations are made to complete the lighting plants at the navy yards as projected and already inaugurated

RECEIVING SHIPS.

In former reports it has been urged that receiving ships should be installed with electric lights. One, the "Vermont," located at the New York Navy Yard, is about to be installed, sufficient funds having been appropriated for that purpose. If the navy yards are supplied with a central station, the receiving ships can be lighted from that station, rendering it both unnecessary and unadvisable to have separate plants for their use. The "Vermont" is an exception, since to light her from the central station at New York would require the use of a submarine cable, which would be costly and difficult to keep in repairs, on account of the passage of ships, anchoring and dredging.

ELECTRIC MOTORS ON SHIP BOARD.

A one-half horse-power Sprague motor has been installed on board of the "Yorktown" for the purpose of ventilating the dynamo room. It is secured to the armored deck over the dynamo room and belted to the shaft of the 24-inch Blackman exhaust-fan. When first used the motor heated excessively and it was feared that the armature would burn out. After several trials and examinations it was found that the motor was over-loaded, caused by the belt being too tight and the fan bearings not in line; there were also deficient arrangements for lubricating the fan. In time all these defects were remedied and the motor is now doing efficient service, the dynamo room being well ventilated. It was not the intention of the present inspector to have a belted motor for this purpose, but the apparatus was installed by the Bureau of Construction and Repair, and was not, therefore, under the inspector's control. It is deemed best for many reasons that the motor should be directly connected with the fan shaft.

On board of the cruiser "Charleston" a one-half horse-power "C. & C." motor is directly connected to a small fan similar to the Sturtevant blowers. In this instance cool air is drawn into the dynamo room by means of a fan, the hot air passing out through a separate pipe, with an entrance at the highest point of the curved armored deck over the dynamo room, by natural draught.

This fan works very well, but is deficient in power, and does not keep the dynamo room sufficiently cool.

On board of the "Baltimore" a fan of

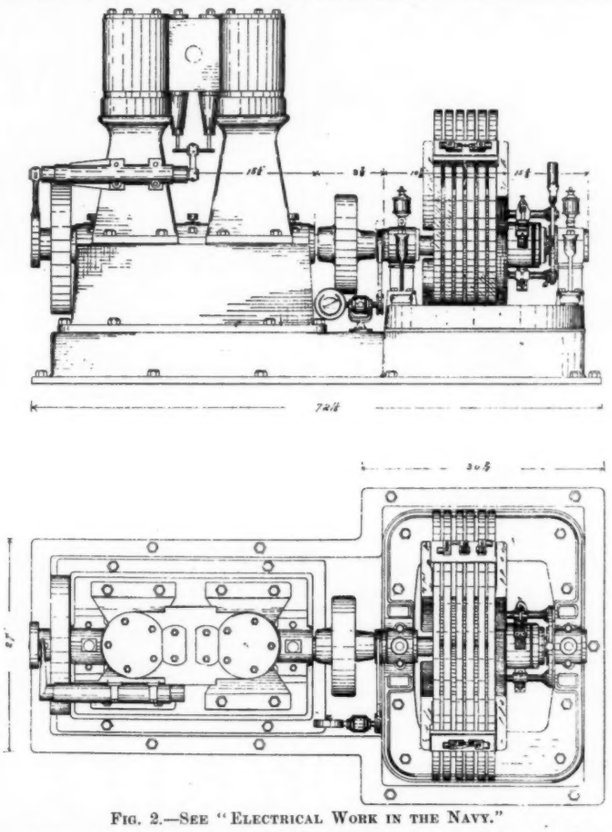


FIG. 2.—SEE "ELECTRICAL WORK IN THE NAVY."

similar design has been located. It is expected after sufficient experiments have been conducted, that very serviceable motors and fans for ventilating purposes will be supplied. It is also hoped that small fans for agitating the air, which can be attached to any lamp socket, may be produced at sufficient cost so that they can be supplied to ships.

RECOMMENDATIONS, ETC.

At present there are attached to this office two officers as assistants, and one civilian, an expert aid. The large amount of correspondence carried on with the local inspectors at navy yards and at the works of ship builders, and with electrical companies, also the preparations of detailed specifications for electrical appliances in the new ships, has rendered this increase in office force an absolute necessity.

As appliances and fittings for use on ships are very different from those in use on shore, designs must be made for most of them, and it would be economy to employ a draughtsman in the office, since without one the specifications for these special appliances are necessarily made to read "of an approved pattern;" not knowing exactly what is required, bidders usually figure on a very safe margin. In the opinion of the present inspector, the use of a draughtsman and the collection of suitable models and patterns would decrease the cost of the work much more than the salary of a draughtsman, besides facilitating the spreading of the information necessary on such a technical branch as electricity.

On account of the great number of electrical fittings and supplies, in addition to those used for electric lighting purposes, now being introduced in the new ships, I beg to suggest that the name of this office be changed from that of Naval Inspector of Electric Lighting to Naval Inspector of Electric Appliances.

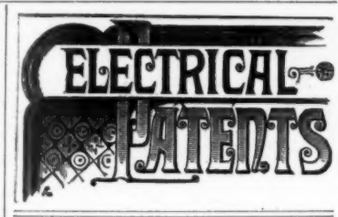
It is a difficult matter to find officers who are qualified to superintend the installation of electrical appliances on ship board, and it is a matter of much regret that those who do qualify for this technical work can receive no compensation for the additional amount of study and labor required to attain that end. In foreign services officers receive extra compensation for qualifying for such work, and when on duty at navy yards, naval academy or torpedo station in our service, are provided with quarters and other perquisities, which it is impossible for them to receive when on duty under this office. Could this defect be remedied by legislation, in the way of allowing commutation for quarters, as in the army, or in some other way, it would be an act of simple justice.

At the dock yard, Portsmouth, England, no less than 150 men are employed on electrical work alone on board of naval ships. The present inspector favors contract work, but if a few men skilled in doing labor of this kind were employed at navy yards by the Government for repairs and changes, also for doing new work under some circumstances, the result would be economical and add much to the efficiency of the plants at present installed. This particularly applies to changes and repairs, when ships are at the navy yards, since under those circumstances contract work is very expensive.

Attention is called to the subject of electric signals. Under the present orders of administration the wiring for such purposes is done under the supervision of this office. At present, however, no recognized system has been adopted, and the inspector is at a loss to know what to provide for such purposes. I have the honor to suggest that a board be ordered to consider the systems now in use, and recommend some one for adoption.

Attention is further called to the large number of officers employed in foreign services to supervise naval electrical work, a commander with a large staff of assistants being attached to the English admiralty for this purpose alone. During the past year a great advance has been made in establishing in our own service a similar office. I have the honor to suggest that young officers who will volunteer for the special training necessary to qualify them to assist in this work be given every opportunity to attend courses of instruction at such institutions as the Johns Hopkins University at Baltimore, and others equally good, and that they be given duty pay while attending the course of instruction, also, if possible, to have their tuition paid and the necessary books supplied.

San Antonio, Texas.—The San Antonio and Aransas Pass Telegraph Company has been organized in San Antonio with a capital of $200,000. The officers of the new company are the same as those who manage and control the San Antonio and Aransas Pass Railway.



INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON DECEMBER 17, 1889.

417,217 Electrical apparatus; Chauncey D. Baker and Lewie G. Bronson, Chicago, Ill.

417,258 Railway signal; Irwin W. Loy and Richard O'Toole, Mechanicstown, assignors of one-third to John E. Mathews, Baltimore, Md.

417,259 Electrically-propelled vehicle; William Main, Brooklyn, N. Y.

417,271 Telephone exchange apparatus; Joseph J. O'Connell, Chicago, Ill.

417,290 Galvanic battery; Elmer A. Sperry, Chicago, Ill., assignor to the Electrical Supply Co., Ansonia, Conn.

417,304 Electric circuit; John C. Wilson, Boston, Mass.

417,305 Electric circuit; John C. Wilson, Boston, Mass

417,338 Method of operating electric railways; Elias E. Ries, Baltimore, Md., assignor by direct and mesne assignments to Ries & Henderson, same place.

417,392 Treatment of porous pots for electric batteries; Erhard L. Mayer and Henry Liepmann, London, County of Middlesex, England.

417,402 Electrical conductor; Upton H. Balsley, Philadelphia, Pa.

417,407 Electric stenographic pen; Augustus S. Cooper, Santa Barbara, Cal.

417,438 Train-signal; Daniel S. McElroy, New York, N. Y.

417,474 Electric fan; Philip Diehl, Elizabeth, N. J.

417,487 Automatic regulator for dynamos; Chas. D. Jenney, Indianapolis, Ind., assignor to the Thomson-Houston Electric Co., of Conn.

417,497 Combined support and safety device for overhead conductors; Robt. A. Morgan, Jr., Boston, Mass.

417,501 Watchman's electric time-detector; Henry L. Morton, Ukiah, and Frederick W. Cook, San Francisco, Cal.

417,511 Multiple telephone; Abner N. Rosebrugh and Thos. R. Rosebrugh, Toronto, Ontario, Can.

417,516 Arc lamp; Jabea F. Shawhan, Dayton, Ohio, assignor of one-half to James W. Carpenter, same place.

417,525 Electric semaphore-setting apparatus; Frederick Stitzel, Louisville, Ky., assignor to the American Semaphore Co., same place.

417,526 Electric semaphore-setting apparatus; Frederick Stitzel and Chas. Weinedel, Louisville, Ky., assignors to the American Semaphore Co., same place.

417,654 System of electrical distribution of currents; Chas. J. Van Depoele, Lynn, Mass.

417,660 Telephonic instrument; William C. Barney, Baltimore, Md.

417,668 Method of regulating the tension of the electric current; Carl Dihlmann, Berlin, Germany, assignor to Seimens & Halske, same place.

417,685 Oiling-plate for electric lights; Harry H. Sawyer, Ridley Park, assignor of one-half to the Thackara Mfg. Co., Philadelphia, Pa.

417,688 Conduit for electrical conductors; James Tatham, Philadelphia, Pa., assignor of one-half to Henry B. Tatham, same place.,

417,694 Lightning-arrester; Paul Winsor and Alexander Wurts, Pittsburgh, Pa., assignors to the Westinghouse Electric Co., same place.

417,695 Lightning-arrester; Paul Winsor, Pittsburgh, Pa., assignor to the Westinghouse Electric Co., same place.

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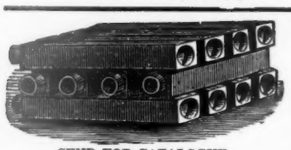

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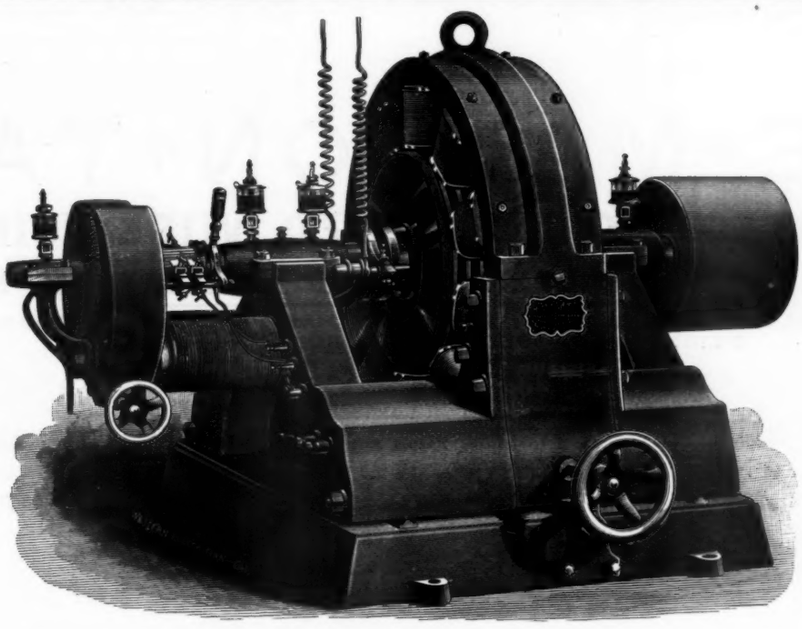

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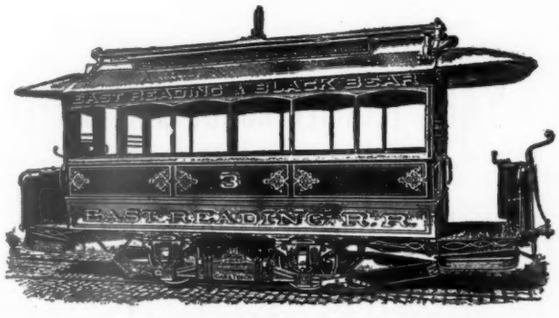

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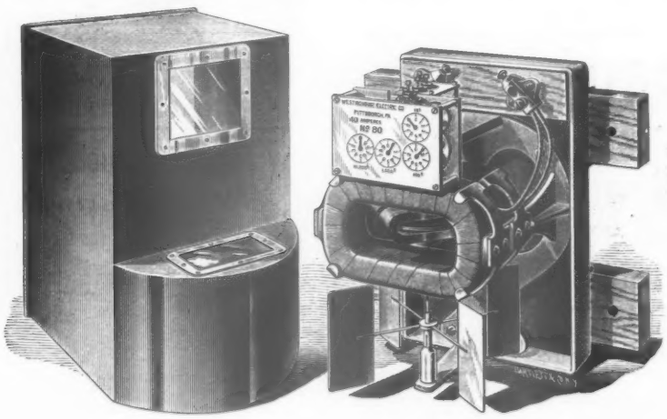

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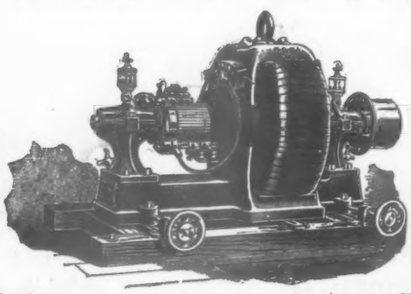

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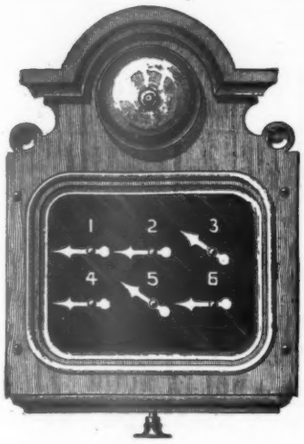

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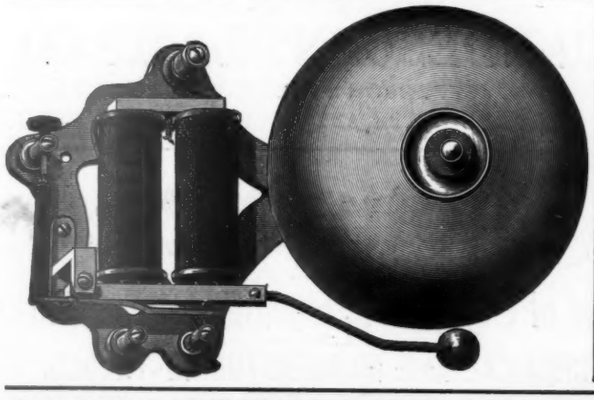

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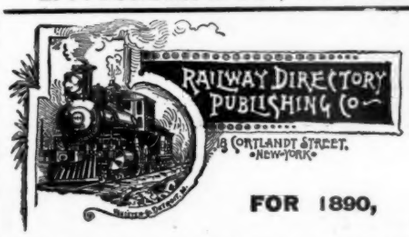

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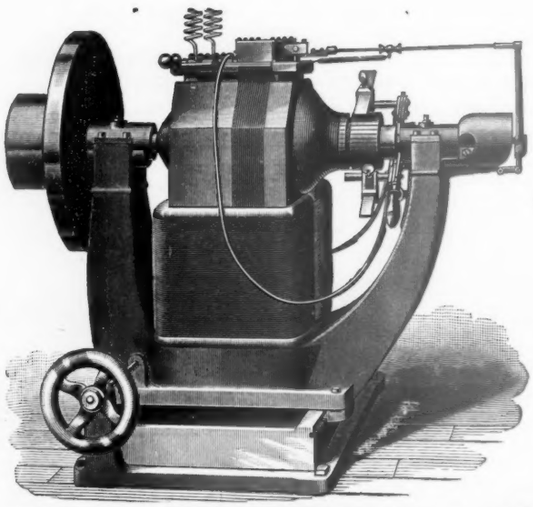

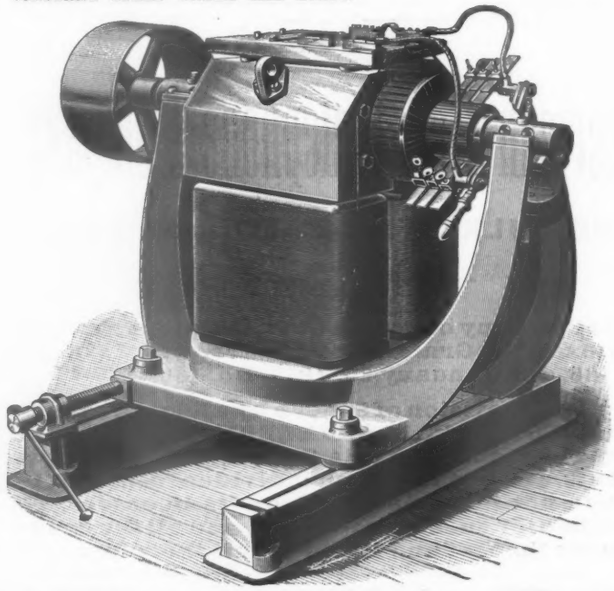

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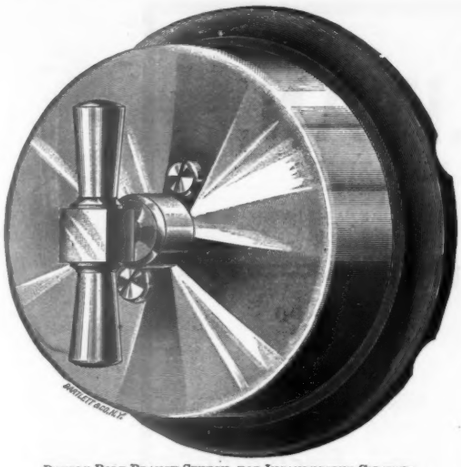

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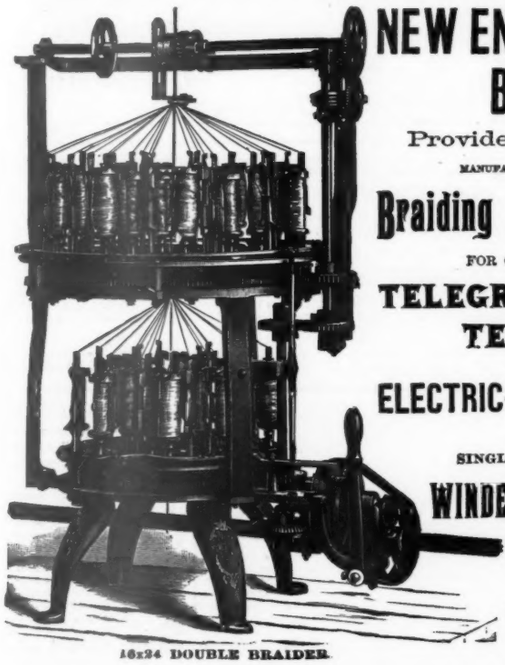

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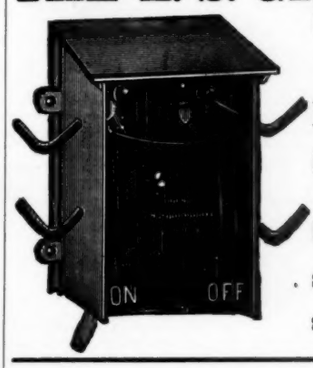

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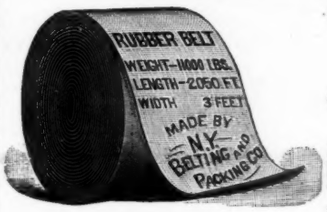

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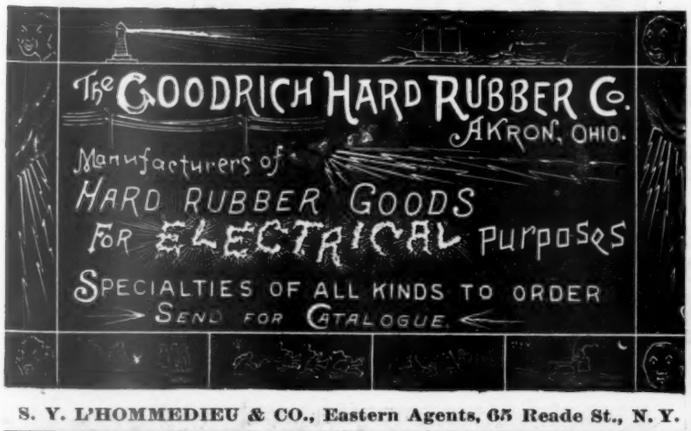

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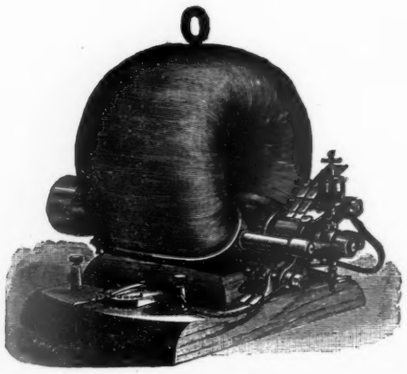

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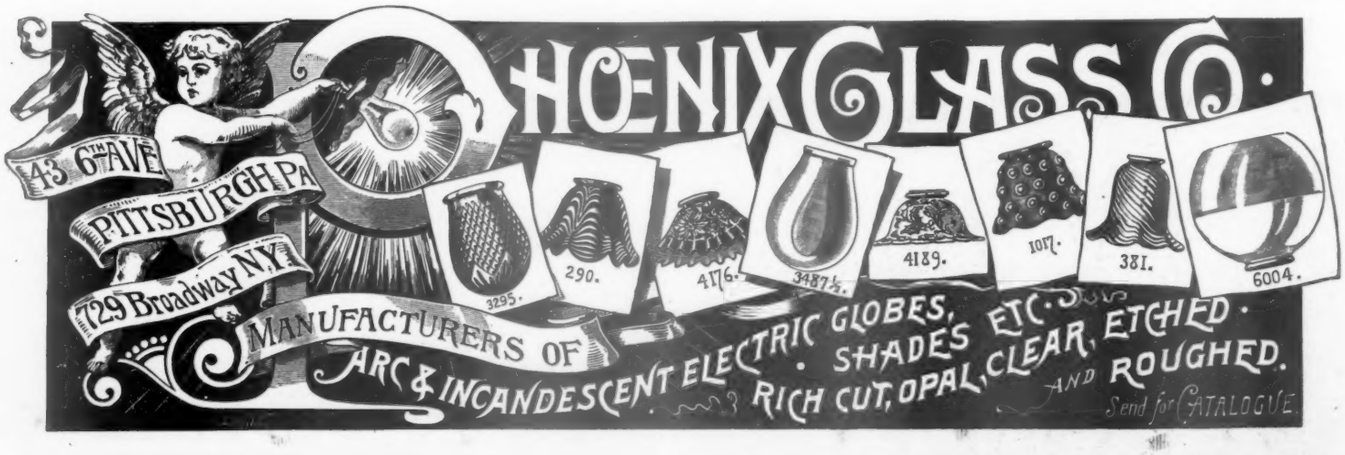

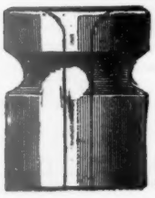

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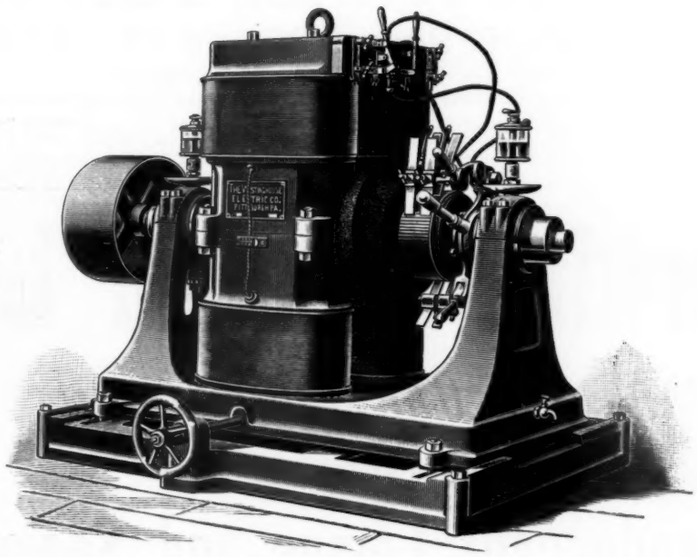

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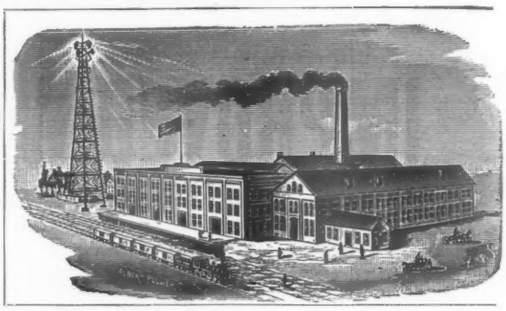

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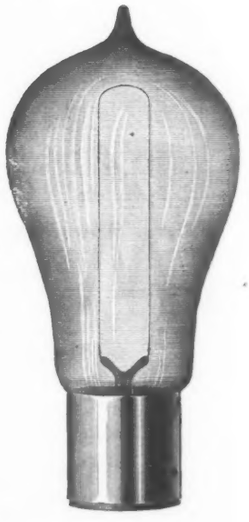

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